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1914

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# PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES  
AND IMPROVEMENTS

IN THE  
MEDICAL AND SURGICAL SCIENCES

EDITED BY  
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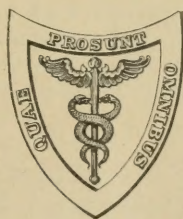
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VOLUME I. MARCH, 1914

SURGERY OF THE HEAD AND NECK—SURGERY OF THE THORAX, EXCLUDING DISEASES  
OF THE BREAST—INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM,  
CROUPOUS PNEUMONIA, AND INFLUENZA—DISEASES OF CHILDREN  
—RHINOLOGY AND LARYNGOLOGY—OTOLOGY



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# PROGRESSIVE MEDICINE.

MARCH, 1914.

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## SURGERY OF THE HEAD AND NECK.

BY CHARLES H. FRAZIER, M.D.

**The Pineal Body.** The detailed and thorough investigation of the hypophysis during the past decade and the splendid results which have been obtained thereby have excited an interest in the other so-called "brain gland," the pineal body or epiphysis. While our knowledge of the physiology and pathology of all the glands now believed to furnish an internal secretion is still in a more or less hypothetical state, this is especially true of the enigmatical organ we are about to consider. Speculations in regard to its function are as old as the science of physiology itself. Descartes, as is well known, designated it as the "seat of the soul." Erroneous as we know many of these ancient conceptions to be, we cannot as yet replace them with any definite and altogether sound theory, for, as Jordan<sup>1</sup> says, certain histological and experimental results are so contradictory that it seems premature to speak of a pineal "gland." The scientists who have been investigating the pineal body consider it of physiological importance, varying all the way from a mere vestigial and functionless organ to a gland with an internal secretion exercising a definite influence on the somatic and psychic development of the individual. Many, though still somewhat skeptical, are half willing to take a middle ground. Vincent, in his recent book on *Internal Secretion and Ductless Glands*, states very guardedly that "there is some evidence that the pineal body controls, in some way or other (possibly by means of an internal secretion), the early growth of the individual." It seems to me, when more careful consideration has been given the clinical syndrome and the pathological studies at autopsy, that it will be pretty generally conceded that the pineal body is one of the links in that chain of ductless glands to which belong the hypophysis, the thyroid, the thymus, the adrenals, etc.,

<sup>1</sup> Translations of the American Microscopical Society, 1912, vol. xxxi, No. 4.

and that, like them, it plays its part in metabolism, and that, when disturbed, it will upset the harmony of their concerted action.

There still remains one field of investigation where the path is as yet unblazed. Through surgery, let us hope, relief may be given to many, and by means of the observations on the operating table many facts may be gleaned which will give us a more precise knowledge of this organ. Any review of the subject at this juncture must be, to a certain extent, premature, as it is impossible to bring the material to a focus, but, if we are to work toward a more perfect correlation in the future, it is important that we should duly consider the theories thus far formulated.

**ANATOMY.** The pineal gland, a small, pinkish body, flattened and almost trilateral in shape and measuring about half an inch in length, is situated in a groove between the corpora quadrigemina just beneath the splenium of the corpus callosum, from which it is separated by a velum interpositum. It forms, posteriorly, the roof of the third ventricle, and its proximity to the communications of the third and fourth ventricles with the cerebellar and pontile spaces is the cause of the frequent occurrence of hydrocephalus with enlargement of the gland. The distal portion, which becomes lobed and solid, is designated, according to Vincent,<sup>1</sup> as the pineal body proper, while this, together with the proximal portion or stalk, should be known as the epiphysis.

**PHYSIOLOGY.** Comparatively little has as yet been written on the possible physiological role of the pineal body, and the conclusions which have been reached are very indefinite. We will dwell but briefly on the principal landmarks. Research has here taken four forms: comparative anatomy and phelogeny, embryology, glandular feeding, first on animals and recently on the human subject, and extirpation of the organ. Apparently no work has been done in transplantation. The first two are of little importance from the standpoint of pathology or the possible development of a pineal surgery. Jordan<sup>2</sup> has investigated the pineal gland of the sheep, cat, dog, guinea-pig, rabbit, and opossum, and states that the macroscopic findings in adult mammals are negative as to functional activity. It is no more developed in horses or large dogs than in puppies, and is practically absent in the opossum. It often becomes cystic without any morbid effects. A careful study<sup>3</sup> of embryology and development in sheep shows that it may have a slight function during the first eight months. These facts are important from our point of view only in showing that experimental work on animals, especially adult animals, cannot be absolutely relied upon as indicative of conditions in the human subject, for while the pineal of an adult

<sup>1</sup> Loc. cit.

<sup>2</sup> American Journal of Anatomy, November, 1911.

<sup>3</sup> Jordan: Histogenesis of the Pineal Body of Sheep, American Journal of Anatomy, November, 1911.



sheep may be functionally *nil*, it may have, as clinical evidence would lead us to assume, an important effect on metabolism and mental development in a young child. Surgery alone can prove the latter absolutely.

The results of glandular feeding have been especially varied, and thus far of no positive value. It must be remembered, however, that organotherapy is still in its infancy, and that anything like definite results have been obtained only from the thyroid. Von Cyon<sup>1</sup> first made injections of pineal extract in 1903. No effect on blood-pressure was noted, while the heart beat became stronger and somewhat slower. He further performed a series of experiments in which electrical stimulation was applied directly to the pineal of the rabbit, causing contraction of the body and movement of the cerebrospinal fluid. He suggests that the pineal regulates mechanically the inflow and outflow of cerebrospinal fluid of the third ventricle. The part this organ plays in cerebrospinal pressure is a much mooted question, and one worthy of attention and further investigation, especially as increased cerebrospinal pressure is noted in many cases of pineal disease. Dana<sup>2</sup> considers this a fanciful theory, as he is unable to find any mention of muscular fibers in the human pineal. Dixon and Halliburton<sup>3</sup> injected extracts of the pineal gland of adult sheep intravenously into anesthetized cats, with the result that there was a slight fall in blood-pressure. Howell<sup>4</sup> records practically the same result. Dixon and Halliburton felt that their work added nothing to our knowledge, and that other methods must be used to determine the function of the pineal. Marburg, however, believes that the pineal is active in early childhood, but not in later life. This may also be true of animals. Kidd<sup>5</sup> feels that a reinvestigation should be made, using extract from newly born or very young animals, and advises two series of experiments, one with very young animals and one with adults. Ott and Scott<sup>6</sup> state that pineal extract causes vasodilatation in the genitalia of male cats, and, further, that intestinal movement and contractile power of uterine muscles were stimulated. Glycosuria was noted after injections in rabbits. Jordan and Eyster<sup>7</sup> report slight fall of blood-pressure and transient diuresis after injection of sheep's extract on dog, cat, sheep, and rabbit. The fall is greater than that of extracts from other parts of the brain.

During the past year, Dana and Berkley<sup>8</sup> have published a preliminary report on some interesting experiments with pineal feeding. The

<sup>1</sup> Pflüger's Archiv, 1903, vol. xcviii, p. 327.

<sup>2</sup> Medical Record, 1913, vol. lxxxiii, No. 19.

<sup>3</sup> Quarterly Journal of Experimental Physiology, 1909, vol. ii, p. 283.

<sup>4</sup> Journal of Experimental Medicine, 1898, vol. iii, p. 245.

<sup>5</sup> British Medical Journal, December 24, 1910.

<sup>6</sup> Ott's Contribution to Physiology, Part xix, 1912.

<sup>7</sup> American Journal of Physiology, vol. xxix, No. 21, 1911.

<sup>8</sup> Medical Record, vol. lxxxiii, 1913, No. 19.

animals used for the feeding experiments were kittens, young guinea-pigs, and rabbits, and the extract was obtained from the glands of young bullocks. The work, which has extended over a period of eighteen months, is briefly as follows: (1) The nucleoproteids and entire gland extracts were obtained and injected into the veins to test the effect on the blood-pressure. (2) They were also injected into young animals for a long time to determine the effect on nutrition. (3) The whole gland was fed to young animals. (4) The whole gland was fed to defective and retarded children. The children selected were mostly under nine, from the retarded grades of the public schools and from the training school at Vineland—children who were merely backward without any notable anatomical defect. The treatment of the 21 children under observation at Vineland extended over a period of four months, and the following summary was submitted by Drs. Cornell and Goddard:

*Mentally.* We find, as a group, the 21 subjects have gained 2.23 points. Of the 14 who gained, the average mental gain is 3.35 points. The 14 controls gained as a group, 1.35 points mentally. Of the 9 who gained, the average mental gain is 2.11 points.

The subject in Groups I, VII, XII, XIV, XVII, XX, XXII gained from 4 to 9 points mentally. In each group where there is any mental advance the children have the mentality of three years or more.

*Physically.* The gain in the standing height for the 21 subjects averages 18.52 mm.; for the 14 controls, 24 mm. In weight, the 21 subjects gained an average of 2.06 kg., the 14 controls, 2.89 kg. There was no loss of weight in either subjects or controls. In grip of R. H., the 21 subjects gained an average of 0.9 kg. as a group, and the 12 who gained averaged 1.58 kg. each. The 14 controls gained an average of 3.43 kg., the 10 who gained averaged 4.8 kg. each.

This work is noteworthy as being the first instance of the therapeutic employment of pineal extract. Dana and Berkley feel, in view of the slight gain recorded, that the experiments should be extended over a much longer period. Their conclusions are as follows: The pineal gland is the vestigium of a special sense organ of vision in invertebrates and certain low vertebrates. In man it has practically lost all the structural characters of a sense organ and has those of a glandular body. It undergoes some involution at about the seventh year of life. We are strongly of the opinion that in the early period of life it has influence over bodily nutrition, including the development of the genital organs, the deposit of subcutaneous fat, general growth, and mental progress. We find that the extract of the pineal gland of bullocks injected into the veins of dogs has no effect on the blood-pressure.

The question of the *relation of the pineal body to the hypophysis* is one well worthy of consideration, as even these varied results are quite the reverse of those from pituitary feeding, and intimate, as suggested by Kidd and Jordan, a possible compensatory relationship,



the function of one gland increasing as that of the other weakens. This can be proved definitely only by trying pineal feeding and transplantation experiments on completely hypophysectomized animals, as Kidd suggests.

Some work has been done on extirpation of the pineal, but the results throw little more light on the question of its physiological importance. Exner and Boese<sup>1</sup> have recently operated on 95 rabbits, of which number 22 were observed for sometime and 6 lived to sexual maturity. The removal of the pineal had no effect on metabolism and did not cause premature sexual development. Biedl,<sup>2</sup> of Vienna, who has explored the entire field of internal secretions, has removed the pineal body from a number of adult dogs, of which 3 lived from three weeks to two months, but the autopsies in these cases were negative as far as the pineal was concerned. He, therefore, considers it of no importance as an internal secreting organ in the adult animal. He has not yet completed his experiments on young animals. Fischera has experimented on chickens, and Sarteschi removed the gland from 11 rabbits, reporting no result other than emaciation. The sheep or lamb would be the most satisfactory for this work, but as yet no one has successfully removed a sheep's pineal.

The following is a summary of the results obtained by Foà<sup>3</sup> in his experiments on young chickens and cocks:

1. Complete extirpation of the pineal body is possible in young chickens twenty to thirty days old.

2. The extirpation of the pineal from chickens during the first month of life causes a retardation of development during the first two or three months which follow the operation; then the animals begin to develop normally.

3. Both primary and secondary sexual characteristics develop prematurely in the cocks from whom the pineal body is removed.

4. Hypertrophy of the testicles was found in cocks killed from eight to eleven months after the operation.

5. No appreciable macroscopic difference is noted in the other organs of internal secretion, in the skeleton or development of adipose tissue. A histological examination will be made, and form the basis of a later report.

6. No difference whatsoever was noted in the hens from whom the pineal was removed.

As the result of the histological examination of the pineal body in these experiments and certain clinical observations, Foà has reached the conclusion that the pineal body is not a rudimentary organ without

<sup>1</sup> Deutsch. Zeitschr. f. Chir., 1910, vol. cvii, p. 182.

<sup>2</sup> Biedl, A., 1913. "Innere Sekretion," Berlin.

<sup>3</sup> Archives Italiennes de Biologie, 1912, vol. lvii.

function, but rather a gland with an internal secretion, upon which depends the development of the testicles. He does not agree fully with Marburg that hypopinealism alone causes premature sexual development, while apinealism brings about cachexia. Foà's experiences lead him to believe that precocity and premature sexual development are the result of apinealism.

Kidd,<sup>1</sup> in his recent and very excellent review of the entire subject, summarizes our knowledge up to the present time as follows;

1. The facts of comparative anatomy, embryology, histology, clinicopathology, and experimental physiology point to the belief that the pineal body is functional in all those vertebrates which possess one.

2. The pineal body is a metamorphosed organ; not a rudimentary, useless, degenerated, degenerating, or disappearing organ; the phenomena which have been urged in favor of the latter hypothesis have been erroneously interpreted.

3. The pineal body probably furnishes an internal secretion; the crucial test for this may prove difficult of attainment; it has not yet been attempted.

4. So far as our at present imperfectly applied experimental studies have taught us, the pineal body of very young birds and mammals has an inhibitory action on the development of the testes and—probably through them—on bodily growth and the appearance of the secondary sexual characters.

5. A relationship of the pineal body with the ovaries is suggested by certain experiments, but has not yet received confirmation from those of Foà (1912).

6. A relationship with pituitary and the adrenal cortex is probable, with the thyroid and thymus possible; but on these points nothing certain is yet known.

7. Histological studies, and also the most recent experiments of Ott and Scott on adult pinealine (1912), seem to show that, in addition to its prepuberal-sexual function, the pineal body of man and other mammals has at least one other function; it is not primarily, at any rate, a sexual one; and it appears to be active either from puberty to the end of life, or from birth.

8. A true partial pineal involution begins normally in childhood, at about the age of seven years, and is normally complete at puberty; its meaning is that the prepuberal-sexual function of the pineal body has come to an end, and, therefore, involution occurs of those pineal elements which subserve that function.

9. The adult mammalian pineal body seems to have definite actions on some unstriped muscles, and it is functionally active normally up to the end of life.

<sup>1</sup> Review of Neurology and Psychiatry, 1913, vol. xi, Nos. 1 and 2.

10. The neuroglial and connective-tissue elements of the pineal body may have specific functions quite apart from their purely mechanical role; but nothing definite is yet known on this matter.

11. The size of the pineal body bears no relation to the size of the brain or the size of the body.

12. The great variations of the pineal body—sometimes even in closely related forms—suggest that its functions vary, and are relatively greater in some than in others.

13. We are not yet in a position to say how the pineal body functionates.

14. The future of pineal physiology lies probably mainly in the hands of the experimental and chemical physiologist, to a less degree of the pathologist, and possibly to some extent of the experimental embryologist.

**PATHOLOGY.** Tumors of the pineal body are still of rare occurrence. In 1901, Newmann collected 22, 19 in males, 3 in females, the majority being in children. Sarcoma, cyst, and teratoma are of most frequent occurrence, the cysts being sometimes attended with untoward results, and sometimes without any special clinical signs. Glioma, carcinoma, adenoma, and sarcoma, and tumors composed of various kinds of tissue have been found to replace the pineal body. Rorschach<sup>1</sup> has collected 47 cases from literature up to the present time. Of these, there were 15 sarcoma, 9 cysts, 5 teratoma, 5 glioma, 4 carcinoma, 2 psammoma, 2 mixed tumors, 1 round-cell sarcoma or syphiloma, 1 chorio-epithelioma, 1 adenoma, 1 syphiloma, and 1 gelatinous appearing tumor. In the 37 cases in which the sex was noted, 29 were in males and 8 in females. The majority of these tumors were the size of a walnut or larger. The sarcoma occurred between the ages of ten and twenty years; the teratoma between five and a half and twenty-seven years; and the carcinoma occurred in patients aged nineteen, twenty-three, twenty-four, and thirty-seven years.

**SYMPTOMATOLOGY.** While there is still more or less haze about the disorders of the ductless glands, certain distinct clinical types are gradually being recognized and defined as indicative of perverted function of the thyroid, of the hypophysis, of the adrenals, and of the others, and more recently of the pineal body. Indeed it is only by considering carefully the extremes of excessive and insufficient function of these ductless glands that we can hope to arrive at a knowledge of their normal action. The difficulties are tremendous. The thyroid is the only gland in which there is a clear-cut distinction between hyperfunction and hypofunction, and even here, though hyperplasia always leads definitely to Graves' disease, extirpation of the gland does not produce myxedema or cretinism. But just as we always associate the latter disease with a disorder of the thyroid, so I think we can consider

<sup>1</sup> Bruns, Beitr. z. klin. Chir., 1913, vol. lxxxiii, p. 451.



the "macrogenitosomia præcox" described by Pellizi<sup>1</sup> as the result of pineal disease—possibly hypopinealism—even though the physiological work reviewed above would seem to indicate its importance as practically *nil*. A careful examination of the clinical and the autopsy findings of the almost four dozen cases of pineal lesions which have thus far been published makes it possible for us to speak with all verity of a definite pineal syndrome. The characteristic train of symptoms which accompany them are analogous, in some points, to those accompanying pituitary disease, and, in others, distinctly antagonistic. It is to Marburg, Frankl-Hochwart, Ogle, Gutzeit, and Oesteriech that we owe our present knowledge of the pathology of this organ.

The symptoms, as recognized at the present time, may be divided into two groups: First, those which arise from general pressure and from local pressure; and secondly, the specific symptoms which are caused by disturbance of the physiological function of the organ itself, resulting in obesity, sometimes followed by fatty atrophy and cachexia, genital hypertrophy, and premature somatic and often mental development. When both classes of symptoms are present, the diagnosis is reasonably certain, and it behooves us at least to consider the possibility of operative intervention, as statistics<sup>2</sup> show that death is sure to occur any time from a few weeks to several years after the onset of the disease.

Let us now consider the first group, namely, those symptoms indicative of increased cerebrospinal pressure, or pressure on the adjacent structures, which are very similar to the symptoms observed in cases of cerebellar tumor. These appear in the initial stage of the disease and progress rapidly toward death as soon as the tumor exceeds the size of a walnut (Bailey and Jelliffe).<sup>3</sup> Among the first signs are headache, mostly occipital, tenderness in that region, amblyopia and papilledema, and other general pressure-symptoms, including vomiting and vertigo. Then appears the somnolence and apathy caused by pressure on the aqueduct with the resulting hydrocephalus, oculomotor disturbances, slow pulse, due to disturbances of the vagus centre, which was noted in 7 out of 18 cases. The motor anomalies take the form of ataxia, both static and locomotor, exaggerated reflexes, spastic tremors, and occasionally facial paralysis. There is also dizziness, cerebellar asynergia and adiadokokinesis, as in tumors of the corpora quadrigemina. Protrusion of the eyeball has been reported in 4 cases. And finally, we observe the almost complete amaurosis, diminished power of hearing and sense of smell, severe pains in the neck, frequent hallucinations, and occasionally hyperesthesia. In the following table, Rorschach indicates the order of sequence of the more common of the symptoms enumerated above:

<sup>1</sup> Neurol. Centralbl., August 1, 1911.

<sup>2</sup> Rorschach, Beitr. z. klin. Chir., 1913, vol. lxxxiii, pp. 451-473

<sup>3</sup> Archives of Internal Medicine, 1911, vol viii, No. 6.

	Head- ache.	Other general symptoms.	Ocular dis- turbances.	Ataxia.	Motor dis- turbances.	Auditory dis- turbances.
Kuy . . . . .	1	2	4	5	3	..
Gauderer . . . . .	1	2	3	4	..	5
Raymond-Claude . . . . .	1	2	5	3	4	..
P. Neumann . . . . .	1	2	3	..	4	2
Hempel . . . . .	1	1	3	2	4	5
Daly . . . . .	1	1	2	1	3	4
Piazza . . . . .	1	1	2	4	5	3
Massot . . . . .	2	1	3	3	..	..
Gutzeit . . . . .	2	1	3	3	5	4
Christ . . . . .	5	4	1	3	..	2
Rorschach . . . . .	2	1	5	4	4	..

Cases of pineal tumor have been reported in which these are the only clinical signs, but they are scarcely sufficient to warrant an accurate diagnosis. In the majority of instances, especially in patients under seven years of age, we find definite trophic disturbances together with premature sexual and mental development. A marked involution in the pineal body takes place at puberty; and Bailey and Jelliffe<sup>1</sup> draw the conclusion that symptoms due to disturbance of function are confined to early life. This last year, however, Rorschach<sup>2</sup> has reported a case of mixed tumor of the pineal accompanied by adiposity and undescended testicles in a young man of twenty-seven. He suggests that this may be an instance of hypertrophy, as the tumor contained much gland tissue and was highly vascular. He states the possibility of a previous hyperfunction, hence insufficient involution, and later formation of tumor. This is only a supposition, however.

The genital hypertrophy, which is noted in practically every case, is considered by most authorities to be the result of hypopinealism, which is in direct opposition to our theory in regard to the hypophysis. It seems evident that the pineal body, through its internal secretion, exercises an inhibitory influence on sexual development, and when, through some pathological change in the organ, this secretion is diminished, there results premature genital development. This is usually accompanied with hypertrichosis. Owing to the large preponderance of the male sex, the question has been raised as to whether there is an especially close connection between the pineal and male genitalia. The whole question of etiology requires further elucidation.

The metabolic changes due to pineal lesions take the form of premature somatic development, obesity, and, in some cases, fatty atrophy and cachexia. It is still an open question whether the latter is due to perverted function of the gland or to the tumor itself. The ossification of bones takes place very early, and the skeleton corresponds to that of a child about five years older. Adiposis is recorded in many cases, and appears to be entirely independent of the variety of the tumor.

<sup>1</sup> Loc. cit.<sup>2</sup> Loc. cit.

This makes it exceedingly difficult to differentiate between tumors of the hypophysis and the pineal. Bailey<sup>1</sup> has raised the question whether a tumor of the pineal body, apart from third ventricle hydrocephalus and disturbance of the hypophysis through pressure, can cause adiposis. Indeed, there are cases in which the hypophysis has been flattened, but in many it is normal. It is difficult to make the symptom-complex known as dystrophia adiposo-genitalis and the "macrogenitosomia præcox" coincide. If hypopituitarism produces obesity with sexual atrophy in one instance, it is scarcely possible to attribute obesity and genital hypertrophy to the same cause. Much more light needs to be thrown on the entire subject. It seems certain, at least, that the pineal gland is in some way responsible.

It seems quite plausible to believe that the pineal body also exerts a restraining influence not only over sexual development during childhood, but over mental development as well. In many cases of pineal disease mental precocity has been noted. Psychic development took place at a very early age in the cases cited by Oesterreich and Slawyk, and Raymond and Claude. In one instance, a young boy was so far beyond his years in intellect that he sought to discuss ethical and philosophical problems. Higher mental development seems in all probability to be very closely connected to this small organ as it is to other of the internal secreting glands, but just how or why is still a mystery.

**PATHOGENESIS.** Most authors agree that the symptom-complex above described is due, in the majority of instances, to a lesion of the pineal body. Heredity plays practically no part in it (Vincent).<sup>2</sup> While increased intracranial pressure is present in many cases, this in itself could not cause the characteristic train of symptoms, as one never finds obesity or premature sexual and mental development accompanying hydrocephalus. The preponderance of the evidence seems to point to a perverted function of the organ itself as the etiological factor. Whether each particular symptom is due to a hyper- or hypofunction is still a matter for discussion. Marburg<sup>3</sup> ascribes them as follows:

1. Universal adiposity as due to hyperpinealismus.
2. Premature development of genital organs or genital hypertrophy as due to hypopinealismus.
3. Cachexia as apinealismus.

You will note that (1) and (2) are the exact reverse of our theory in regard to the hypophysis. Kidd and others have, therefore, suggested a compensatory relationship between the two glands, one waning as the other begins to wax. The majority of observers are now in accord that obesity is the result of hypofunction.

**SURGICAL INTERVENTION.** Considering the gravity of the symptoms, we should, it seems to me, concentrate our attention on the elaboration of a technique by which these tumors could be removed, once the

<sup>1</sup> Loc. cit.

<sup>2</sup> Loc. cit.

<sup>3</sup> Loc. cit.



diagnosis has been made. Brunner<sup>1</sup> was led to give this subject consideration through the autopsy findings in the case of a young man of twenty-seven, who was operated on supposedly for a cerebellar tumor. He exhibited all the usual symptoms, and, in addition, a slight obesity. At operation, intracranial tension was found in a high degree, but when the cerebellum was raised and the base of the brain explored, no tumor could be found. At autopsy, a large, mixed tumor was revealed, occupying part of the third ventricle, the pineal body, the region of the aqueduct, and flattening the fourth ventricle. Immediately afterward Brunner elaborated two methods by which the pineal body could be approached: One consists in proceeding between the falx and the hemispheres, laying bare the posterior part of the corpus callosum, separating the latter, and thence proceeding to the fourth ventricle; the other consists in penetrating between the cerebellum and hemispheres along the tentorium cerebelli. He had an opportunity to try the first of these methods on a young man, who presented, besides all the general pressure symptoms, ataxia, oculomotor palsy, disturbances in hearing and smell, etc., which placed the diagnosis pretty accurately on tumor near the fourth ventricle, and raised the question of a pineal growth. The route between the falx and hemispheres was chosen, as pineal and fourth ventricle tumors usually extend upward, raising the corpus callosum. Hence the route between the hemispheres is shorter than that along the tentorium. The operation was performed in two stages, the first of which consisted in the reflection of a horseshoe-shaped osseous flap extending upward to the interparietal sulcus, at the side to the petrous portion of the temporal bone, and below to the level of the transverse sinus. At the second sitting a transverse incision to the right of the sinus about 6 cm. in length was made in the dura, and the latter reflected. The falx was then pushed gently to the left, and the right hemisphere raised slightly to the right, while the index finger was passed along the falx to the corpus callosum. In order to obtain sufficient space to split the latter structure, the anterior part of the bony opening was enlarged. The corpus was split for about 4 cm. between the posterior and middle third of its length, and the right lateral ventricle opened. Palpation of the fourth ventricle region was practically negative. Approach to the third ventricle was still impossible. The operative field was so narrow and the approach to it so deep that further manipulation could not be risked. The flap was replaced. Three and one-half months after the operation, the general pressure symptoms had disappeared, while the ataxia and other symptoms indicative of cerebellar lesion remained uninfluenced. Though the goal aimed at was not reached, nevertheless Brunner has proved that the corpus callosum can be separated without great danger. Whether or not a feasible

<sup>1</sup> Bruns, Beitr. z. klin. Chir., 1913, vol. lxxxiii, p. 451.

mode of approach to the pineal body can be developed remains for the future to decide.

**The Hypophysis.** Owing to the ever-increasing attention given the various problems connected with pituitary disorders and the large number of cases which are being correctly diagnosed and operated upon, very decided progress has been made in this field during the past year. Nevertheless, the surgeon is still confronted with many difficulties in his attempts to deal intelligently with lesions of this region, and many problems of more than mere academic interest remain unsolved.

**PHYSIOLOGY.** Possibly the greatest of these is the question as to how much, if any, of the gland is essential to the maintenance of life. Reference has been made in previous years to the contradictory results obtained by the various research workers, and nothing of a decisive nature has been done during the past year toward the solution of the problem. The gland may be exposed by a faultless technique, yet in the face of a very extensive hyperplasia, or a large and malignant growth, there necessarily must be uncertainty in the surgeon's mind as to how much of the tissue can be safely removed.

Again, the fact that the hypophysis bears a definite relation to the other internal secreting glands, especially the thyroid and the sexual organs, must not be lost sight of. Schäfer,<sup>1</sup> in a paper at the Royal Society of Medicine, last year enumerated the changes in the hypophysis following thyroidectomy as follows:

1. Enlargement of the whole pituitary.
2. Presence of colloid substance in vesicles of the pars anterior and a great increase in that of the pars intermedia. This colloid substance differs, however, as already stated, from that of the thyroid in never containing iodine.
3. Great increase in the number of hyaline bodies in the pars intermedia and pars nervosa right up to extension of the cavity of the third ventricle into the gland.

Schäfer considers that both glands are connected in some way with growth and general nutrition, especially sexual development, for it is constantly observed that in the case of removal or destructive changes in either gland in young animals, sexual infantilism and general stunting of growth occur with a tendency to mental dulness and obesity at all ages.

Schäfer believes, as do most physiologists, that the functions of the hypophysis are carried out by means of chemical agents or hormones which pass either directly or indirectly into the blood and thus exert an influence on other and distant organs. While a lengthy discussion of the function of the gland as a whole and its component parts might

<sup>1</sup> Proceedings, 1913, vol. vi, No. 7.

not be entirely germane to the subject, nevertheless, in order to intelligently treat acromegaly or the dystrophia adiposogenitalis, which are expressions of perverted pituitary function, it is necessary at least to have a knowledge of the workings of the organ and the conditions which are etiologically responsible for these two disorders. Here again we find much obscurity and difference of opinion. The experiments of Schäfer and Oliver, Howell, Dale and Blair Bell, and others, would seem to show that the two lobes have quite distinct functions, the anterior being related to general growth of the body and especially the skeleton, and the posterior lobe, including the pars intermedia, serving to promote contractility and increased tone of muscular tissues with a marked influence on the heart, and to excite the activity of certain glands, especially the kidney and mammary glands. Fuhner<sup>1</sup> has succeeded in isolating a pure active substance from the posterior lobe and infundibulum which he calls "*hypophysin*." By means of experiments on cats, rabbits, sheep, and rats he has proved that it has a decided influence on blood-pressure, respiration, and uterine contractions.

A great deal of time and study has been given to the effects of disordered functions of the pituitary body and many efforts to correlate cause and effect have been made, but as yet we are groping between several theories. The majority agree that acromegaly is caused by increased function or hyperpituitarism, and most of us agree with Fischer<sup>2</sup> that acromegaly does not exist without hypertrophy or at least some pathological change in the hypophysis. That this condition is due to a hypersecretion of the anterior lobe is also pretty generally conceded.<sup>3</sup> Much more complex, however, is the relation between the hypophysis and dystrophia adiposo-genitalis. Fischer<sup>4</sup> has gone over this problem very carefully in a recent article. Fröhlich's theory is that this particular syndrome is brought about by dyspituitarism—a disturbance in the internal secretion, while Erdheim believes that it is caused by pressure, either through a tumor or some other pathological process, on an unknown centre in the base of the brain, and Cushing places the cause in posterior lobe insufficiency. Fischer, on the other hand, believes that the etiological basis for this symptom-complex is an injury, which is usually mechanical, in the form of pressure, of the posterior lobe and infundibulum rather than hypofunction. The flow of the secretion from the anterior lobe to the third ventricle is hindered through pressure on the infundibulum. Otherwise, it would

<sup>1</sup> Deutsch. med. Woch., 1913, vol. xxx, No. 11.

<sup>2</sup> Frankfurter Zeit. f. Path., 1912, vol. xi.

<sup>3</sup> Cushing, American Journal of Medical Science, 1913, vol. cxlv, No. 3; Miller and Lewis, Archives of Internal Medicine, 1913, vol. xii, No. 2; v. Bonin, Quarterly Journal of Medicine, 1913, vol. vi, No. 22.

<sup>4</sup> Loc. cit.



be hard to account for the coexistence of acromegaly and dystrophy which we so often see. His theory is supported by both clinical and experimental data. A slight pressure on the posterior lobe, he believes, causes genital disturbance, while a stronger pressure will produce adiposity. This accounts for the genital disorders which usually accompany acromegaly. v. Bonin and Lewis and Miller<sup>1</sup> believe that in all probability dystrophia adiposo-genitalis is due to a deficient activity of the anterior lobe. According to the latter authors, partial removal of the anterior lobe in young animals has produced symptoms very like the Fröhlich syndrome, while a partial removal of the posterior lobe has practically no effect on growth.

**SYMPTOMATOLOGY.** While much has been accomplished by physiological research, still finer analyses will be possible in the near future through careful clinical and pathological studies. We will very soon have to revise our ideas concerning the symptom-complex of pituitary disease. In human pathology we are obliged to deal mostly with dyspituitarism, as there are few cases of pure hypo- or hyperpituitarism. As we saw above in practically all cases of acromegaly there is sufficient pressure on the pars nervosa to cause genital disturbances, sometimes even adiposity. There are other cases in which there is no evidence whatsoever of any disturbance of metabolic processes, as in two cases upon which I recently operated where the only symptoms were due to pressure on the optic chiasm and to intracranial tension. In a recent paper on "Lesions of the Hypophysis from the Viewpoint of the Surgeon," I<sup>2</sup> dwelled on this subject quite extensively, showing the absence of any constant relation between the clinical picture and the character of the lesion, so that it is practically impossible before the operation to determine anything of the nature of the lesion. My investigations of the pathological reports or autopsy findings at 74 operations for lesions of the hypophysis show that any three of the pathological lesions may be accompanied by any of the three clinical syndromes, either separately or in combination.

I will not dwell at length on the various symptoms of hypophysial disorders, as this was done last year, but merely emphasize certain points which have been strongly brought out in recent cases. Harris and Graham<sup>3</sup> divide the symptoms into three groups: First, those produced by pressure on neighboring structures, particularly the optic chiasm and nerves, and occasionally the cerebral peduncles. Pressure in the latter case is seldom sufficient to produce definite parietic phenomena, though the extensor reflex is found, and sometimes weakness in the legs and an unsteady gait. In the second group are the symptoms due to intracranial pressure, and in the third those due to interference

<sup>1</sup> Loc. cit.

<sup>2</sup> Surg., Gyn., and Obst., December, 1913.

<sup>3</sup> Lancet, November 1, 1913.

with the function of the gland itself. In several cases which have been under my care recently, I<sup>1</sup> have observed severe pains in the limbs. Whether these pains are due to irritation of the cerebral peduncles or are referred is still a matter of conjecture. Biedl (*Innere Sekretion*, Berlin, 1913) mentions muscular pain as a symptom of acromegaly, and Cushing ("The Pituitary Body and its Disorders") describes growing pains in the extremities in one of his cases. In a case reported by Stewart and Brewerton,<sup>2</sup> the patient suffered from pain in the back of the neck, and Genella's<sup>3</sup> patient had persistent neuralgia in the right hand and foot.

Andre Leri,<sup>4</sup> in his very excellent article on acromegaly, divides the pain accompanying acromegaly into three periods: First, while the bones are enlarging, the pains are rheumatic in character and situated principally in the bones and joints of the four extremities; while in the terminal stages, they are neuralgic in type, affecting most commonly the sciatic, trigeminal, and crural nerves. Sometimes the pains are so fulgurant as to simulate tabes. Acroparesthesia, that is, numbness and stiffness of the extremities, I have also found in several cases recently. Sometimes there is a distinct tingling sensation in the fingers. The same phenomenon is noted by Melchior and by Wilcox.<sup>5</sup> Instances have been noted in which the mental disturbances are the predominating feature. Taylor<sup>6</sup> reported recently a case of a woman, aged forty years, with no symptoms other than apathy and general mental derangement. The autopsy revealed a spindle-celled sarcoma of the pituitary body. Two similar cases had been known by Taylor.

**PATHOLOGY.** I<sup>7</sup> have met with a further peculiarity of pituitary lesions in the difficulty which is experienced in attempting to classify them by microscopic examination. Trained pathologists frequently submit opinions on the examination of a given specimen varying from hypoplasia to a benign, or even a malignant, lesion. A careful review of the series of cases above referred to showed how comparatively benignant was the life history of certain malignant lesions, so that in the presence of malignancy, the beneficial effects of operation would extend over a number of years. There is not the same distinction between benign and malignant growths here as between similar lesions in other organs.

v. Bonin<sup>8</sup> has suggested a new scheme of classification for hypophysial

<sup>1</sup> Journal of the American Medical Association, November 1, 1913, vol. lxi.

<sup>2</sup> Proceedings of the Royal Society of Medicine, 1913, vol. vi, No. 7.

<sup>3</sup> New Orleans Medical and Surgical Journal, 1913, vol. lxvi, No. 2.

<sup>4</sup> Handbuch der Neurologie, 1913, vol. iv.

<sup>5</sup> Proceedings of the Royal Society of Medicine, 1913, vol. vi, No. 7.

<sup>6</sup> The Lancet, November 22, 1913.

<sup>7</sup> Surg., Gyn., and Obst., December, 1913.

<sup>8</sup> British Medical Journal, 1913, vol. i, No. 2731.

lesions based on the principle of histogenesis, which is practically as follows:

I. Heterotopic Tumors.

1. Tumors of the craniopharyngeal duct.
2. Teratomas.

II. Homoiotopic Tumors.

1. Epithelial tumors:

- |   |  |   |
|---|--|---|
| (a) From anterior lobe                      | $\left\{ \begin{array}{l} \text{Chromophile} \\ \text{Chromophobe} \\ \text{Combined} \end{array} \right.$ | $\left\{ \begin{array}{l} \text{Cubic cell} \\ \text{adenoma} \\ \text{Round-cell} \\ \text{adenoma} \\ \text{Carcinoma} \end{array} \right.$ |
| (b) From pars intermedia                    |  |   |
| 2. Tumors developed from connective tissue: |  |   |
| (a) From anterior lobe and pars intermedia  | $\left\{ \begin{array}{l} \text{Fibroma} \\ \text{Sarcoma} \end{array} \right.$                            | $\left\{ \begin{array}{l} \text{Glioma} \end{array} \right.$  |
| (b) From posterior lobe . . . . .           |  |   |
| 3. Mixed tumors . . . . .                   |  | Fibro-adenoma   |

Epithelial tumors, even when malignant, according to v. Bonin, lead to hyperpituitarism, while tumors developed from the stroma destroy glandular tissue and thus lead to hypopituitarism. The heterotopic variety comprise tumors which develop from tissue normally not in the pituitary body, the homoiotopic arising from tissue normally present in the gland. There is great difficulty in distinguishing between the benign and malignant growths. In fact, so difficult is the differential diagnosis that many round-cell adenomata are classed as sarcomata. This is especially unfortunate, as the prognosis for the former is very good.

**SURGICAL THERAPY.** Last year I described in detail the various techniques for reaching the sella turcica then in use, including my own transfrontal method, which I had then used successfully in 4 cases, and since that time in 3 other cases. During the past year little new has been done in the way of technique. Nowikoff<sup>1</sup> has devised a means of approaching the sella turcica by first resecting the upper jaw and the nose—a method, it seems to me, which is feasible for little else than operations on the cadaver. Rupp<sup>2</sup> has operated by the intracranial technique of Bogojawlensky, described last year, in a case where the only symptoms were ocular disturbances and headache, the roentgenogram showing enlargement of the sella. The tumor could only be partially removed on account of extensive metastasis into the brain, and the patient died in thirty hours. Rupp feels, however, that the intracranial route is to be given preference in all cases on account of the wide approach and the greater freedom from infection. In a paper on Brain Surgery before the German Surgical Congress in 1913, Krause<sup>3</sup> said

<sup>1</sup> Zentralbl. f. Chir., 1913, vol. xl, No. 25.

<sup>2</sup> Deutsch. med. Woch., 1913, vol. xxxix, No. 29.

<sup>3</sup> Abstract in Surg., Gyn., and Obst., September, 1913, p. 271.



he had operated for tumors of the hypophysis according to all the methods now in vogue. Hirsch's method, he feels, requires special rhinological training, and offers no special advantages to the surgeon. He prefers it, however, to Schloffer's technique, because disfigurement is avoided. After operating 7 times, according to the latter's technique, and only once being able to remove the entire tumor, he returned to his former method of approach through the forehead. He advocates this route unreservedly in all cases in which the anterior lobe or neighboring parts of the brain are thought to be involved. One patient, from whom a tumor the size of a plum was removed, according to this mode of approach, four and a half years ago, has lost all symptoms of acromegaly and regained power in the genital organs. Kanavel<sup>1</sup> has recently reported an intranasal operation in a boy, aged eighteen years, with Fröhlich syndrome, pressure symptoms, and blindness. A cyst was evacuated at the operation, and for two years headache and other signs of pressure have disappeared, and sight is restored. He has lost weight, and there has been a distinct growth of hair, though no development of sexual function as yet. Immediately after the operation, the patient was placed on organotherapy, receiving, first, anterior lobe extract, then the extract of the whole gland in doses varying from 12 to 30 gr. daily. There is always the danger of infection, Kanavel feels, when the transphenoidal route is employed, and this method is not feasible in tumors which developed beyond the sella. For this latter group and for neighborhood tumors, the intracranial method should always be employed.

I am convinced, as I stated last year, that in the future the transfrontal method will be adopted by the general surgeon, and that if a transphenoidal method is used at all, it will be practised only by the specialist trained in the technique of intranasal procedures. But little is to be hoped for from the purely palliative procedures, either a sellar decompression or the conventional temporal decompression. While no doubt the latter will relieve for a while the symptoms of general intracranial tension, it will not prevent visual disturbances and ultimate blindness, nor can it influence the symptoms that arise from disturbance of the pituitary function. Hence the scope of this operation is necessarily limited. The mere removal of the floor of the sella turcica would seem to possess greater merit. If we assume at the outset that the great majority of pituitary lesions are inoperable from the surgical viewpoint, we must acknowledge that all the transphenoidal methods have at least this advantage to their credit, since, as von Eiselsberg says, their principal feature lies in the fact that we are able to establish a decompression and coincidentally remove a piece of the tumor or evacuate a cyst. As a matter of fact, however, sellar decompression has not proved to have more than a very transitory influence on the course of the disease. Of

<sup>1</sup> Surg., Gyn., and Obst., 1913, vol. xvi, No. 5.

the 74 operations by various operators, there were 29 deaths, a mortality of 29.1 per cent.; but these figures hardly give a fair estimate of what may be accomplished by individual surgeons with large experience in this field. The results in this series have been carefully analyzed from the standpoint of the character of the lesion, the prognosis being most grave in cases of sarcoma, and most favorable in the cases of cyst, as is shown in the following table:

	Total	Improved	Unimproved	Death	Temporary improvement	Final improvement
Hyperplasia . . . .	2	1	..	1		
Struma . . . . .	14	9	2	2	1	
Adenomata . . . .	22	12	..	8	1	1
Carcinoma . . . .	6	1	..	3	..	2
Sarcoma . . . . .	10	2	..	7	..	1
Cysts . . . . .	11	7	..	3	..	1
Teratoma . . . . .	3	1	..	2		
Chordoma . . . . .	1	..	..	1		
Fibroma . . . . .	1	..	..	1		
Tumors . . . . .	4	3	..	1		
	<hr/> 74	<hr/> 36	<hr/> 2	<hr/> 29	<hr/> 2	<hr/> 5

While the surgery of the hypophysis is still in a developmental stage I do believe that the time has come when the propriety of the operation is justified in properly selected cases. The field is still comparatively limited. Glandular therapy, including the use of both thyroid and pituitary extracts, should be given a fair trial, at least until vision is threatened or the progress of the disease has proved to be uninfluenced. There does not seem to be any future for purely palliative procedures, particularly temporal decompression, and, if operation is to be resorted to, it should consist in an attempt at the removal of a considerable portion of the tumor. There are well-substantiated records to show that in the accomplishment of this, the beneficial effects of the operation may extend over a period of at least five years. There is little evidence yet to show that the operation will be followed by a complete retrogression of the effects of perverted tissue metabolism, although they may be arrested and other subjective symptoms, such as headache, impending blindness, somnolence, and psychic disorders, relieved. Therefore, I firmly believe that operation should not be delayed too long.

GLANDULAR THERAPY. My results from glandular feeding have been exceedingly good, both in cases where there has been no intervention and as a postoperative treatment. In a symposium<sup>1</sup> on the pituitary body at a joint meeting on the sections on Neurology and Ophthalmology at the Royal Society of Medicine, March 5, 1913, some very excellent results were reported from glandular feeding. Eason had

<sup>1</sup> Proceedings, vol. vi, No. 7.

given 5 grains of thyroid extract three times a day in 3 cases. In the first one, a man aged thirty years, with headache, failing vision, and sexual disturbance of five months' standing, there was great improvement in vision at the end of eight months. The treatment was continued over a period of five years with no retrogression. In the other 2 cases there was improvement, though not as marked, as the symptoms were of longer duration. Gordon Holmes, in the same symposium, reports a case of early acromegaly in which there was loss of weight and less headache after the administration of thyroid extract.

One of the most striking instances of the positive influence of glandular feeding was a case of a young woman whom I saw with Dr. G. E. de Schweinitz.<sup>1</sup> There was intense headache and nausea, enlargement of the sella turcica, cessation of menstruation, bitemporal hemianopsia, first for colors and later for form, followed by a gradual disappearance of the entire visual field, with total blindness of the right eye, lasting twelve days, and of the left eye, lasting six weeks. After months of treatment, there was complete restoration of vision as the result of the administration of large doses of thyroid extract, associated with inunctions of unguentum hydrargyrum. I place practically all my patients on this treatment immediately after operation, and do not feel that the estimation of the benefits derived from operation is complete unless one takes into consideration the effects of the supplemental treatment by glandular therapy.

**Trigeminal Neuralgia.** In few fields of cranial surgery has progress been either as marked or as satisfactory as in the treatment of lesions of the trigeminal nerve. The outlook for those suffering from tic douloureux, even of the most severe and formidable type, has assumed a most hopeful aspect, for while trigeminal neuralgia has claimed the conjoint attention of surgeons and neurologists for some time, it was only in the early nineties that the first radical operation on the ganglion was performed, and less than ten years ago that Schlösser introduced his method of alcoholic injection. The most careful studies in the anatomy and topography of the trigeminal distribution and the development and perfection of the operative technique by those skilled in intracranial surgery has lowered the mortality from over 20 per cent. to between 2 per cent. and 3 per cent., and has enabled us to extend the application of alcoholic injections from the injection of peripheral branches to that of the ganglion itself. Hitherto, many of my patients had suffered for fifteen or twenty years, had become addicted to morphine, and were on the verge of attempting suicide before they realized that by injection or operation they could be altogether relieved. The years of suffering have been followed by a state of neurasthenia, from

<sup>1</sup> de Schweinitz and Holloway, Journal American Medical Association, September 21, 1912.



which patients are slow to recover, even after the neuralgia has been relieved, and usually all available funds have been spent in trying one fruitless remedy after another.

It is difficult to lay down any general rules as to which method of treatment should be given preference. Each case must be studied from the standpoint of the duration, the severity of the pain, and the condition of the patient. I have been in the habit of resorting almost without exception to alcoholic injection in the incipient cases, when the pain is limited to the distribution of only one or two divisions, only exceptionally practising the Thiersch extraction of the peripheral nerves. When, however, the injections have been tried and proved ineffective, when the patient is in middle life and his general health not impaired, and particularly when he insists upon a treatment which gives absolute assurance against recurrence, I resort to the operation on the ganglion.

The peripheral operation I have discarded altogether, except in cases of neuralgia of the ophthalmic division, because the results of alcoholic injection are equally effective and are applicable to all cases in the second and third division. Recurrences after peripheral operations are the rule rather than the exception, especially after resection of the inferior dental nerve. To obviate this, Levison<sup>1</sup> has had very satisfactory results from the complete removal of the entire inferior dental nerve, including its extreme ramifications which have their endings in the mucosa of the lip, and the incisor branch. After the nerve and all its small branches have been freed from the lip and tissues, it is removed from its canal practically as follows: After chiseling off the lingula, a wire 1 mm. in diameter, having a certain amount of spring and barbed so that the points are directed toward the handle, is introduced into the canal and pushed up until the point has reached the upper opening on the inner surface of the ascending ramus of the jaw, where the nerve is given off from the inferior maxillary nerve; the handle is then slowly turned around on its own axis so that the barbed end comes in contact with the nerve. After turning eight or ten times, the nerve is torn away and removed practically intact.

The two principal reasons for recurrence following the Thiersch avulsion are (1) the tendency of peripheral nerves to regeneration, and (2) the nature of the neuralgia itself, which is often of central origin and therefore inappropriate for the peripheral operation. Various methods have been adopted to obviate the former difficulty, such as blocking the foramina with wax, or gold or silver foil, or the injection of paraffin into the peripheral canal after the nerve has been extracted, but they have proved almost equally ineffective. Of 42 cases of trigeminal neuralgia treated at the Clinic at Kiel, and reported by Otto,<sup>2</sup> there were

<sup>1</sup> California State Journal of Medicine, 1913, vol. xi, No. 2.

<sup>2</sup> Mitteilungen aus d. Grenzgebieten d. Med. u. Chir., 1913, vol. xxv, p. 78.

26 cases of Thiersch avulsion, of which only one was permanently relieved (a period of five years had elapsed). In twenty-two, the period of relief averaged from one to two years, varying from five weeks to three and a half years; 10 had subsequently submitted to other operations; in 5 cases, it was stated that the recurrent pain was less severe in type. Cates<sup>1</sup> proposes another method for preventing the reestablishment of continuity after avulsion. When the supra-orbital nerve has been avulsed, he advises carrying the proximal end of the distal branch under the muscles of the forehead, splitting the occipitofrontalis, and anchoring it with catgut to the under surface of the skin of the forehead. He pulls the proximal end of the distal extremity of the infra-orbital nerve down and attaches it with fine catgut to the tissues of the cheek under the skin, care being taken to break off the continuity of the nerve proximal to the sphenomaxillary fissure. With regard to the inferior dental branch, he pulls slowly and steadily from the centrum, breaking off the nerve proximal to the origin of its lingual branch; then by pulling from the periphery on the terminal division, he succeeds in tearing out the nerve with all its branches in the body of the jaw.

Since the introduction of alcoholic injection by Schlösser, in Munich, over ten years ago, his original technique has been varied somewhat in the hands of Ostwald, Levy, Baudouin, Sicard, Kiliani, Braun, Patrick, and others, until now the alcoholic injection has become a comparatively safe and reliable procedure in the experienced hand. The technique of Levy and Baudouin has been quite universally adopted for injection of the second and third divisions at the base of the skull. Kiliani<sup>2</sup> prefers peripheral injections to injections at the base of the skull, because the peripheral injections are easier, and because he believes that in practically 30 per cent. of the cases the second division is inaccessible at the base of the skull, and because of the possibility of keratitis after the injection of the ganglion. He claims that 22 per cent. of those in which at least one year had expired since the injection, had remained free from recurrence for more than three years. These results, I believe will be found to be exceptional. Judging from the experience of Patrick, and from my own experience, the average interval of freedom will be nearer one than three years, although it will be admitted that the pain of the recurrence is often less severe. Harris,<sup>3</sup> from his experience in 112 cases, has come to feel that injections of the first and third divisions should not be made without some form of anesthesia; the injection of the second division through the sphenomaxillary fossa is not as painful a process, and the anesthetic can here be dispensed with. Nitrous oxide and gas cannot be used on account of the muscular spasms, and chloroform is eliminated because, if the patient loses consciousness,

<sup>1</sup> Boston Medical and Surgical Journal, 1913, vol. clxviii, No. 11.

<sup>2</sup> New York State Journal of Medicine, 1913, vol. xiii, p. 6

<sup>3</sup> Lancet, 1913, vol. i, No. 4674.

it is difficult to tell when the foramen ovale has been reached and the proper amount of alcohol injected. Harris has obtained very satisfactory results from the use of  $\frac{1}{3}$  grain morphine with  $\frac{1}{150}$  grain hyoscine injected hypodermically into the arm twenty minutes before beginning the injection.

The larger and more varied my experience with the injection method, the more convinced I am of the futility of the several instruments which have been devised for the purpose of securing greater accuracy. The wide variation in the shape and the relation of the various bony processes of the skull makes it impossible to formulate any plan whereby the needle may be directed with mathematical accuracy to the desired point. For the comfort of the patient, the skin and subcutaneous tissue are injected with one-half of 1 per cent. of novococaine, the skin and fascia punctured with a Hagedorn needle to facilitate the passage of the platinum needle. Every precaution should be taken to avoid needless contact of the point of the needle with the periosteum of the skull. The periosteum or pericranium is extremely sensitive, and any impact of the needle elicits pain, and, if frequently repeated, so disconcerts the patient as to make the concluding steps of the procedure more difficult.

For those cases which have been unaffected, or only temporarily relieved, by injection or peripheral operation, and for those cases in which the neuralgia may be of central origin, involving one or all three branches, the question has arisen as to whether an injection directly into the ganglion will not be just as efficacious as a gasserectomy or the resection of the sensory root. Last year I referred briefly to the work of Härtel in the Bier Clinic, in Berlin. He has now injected the ganglion in 14 cases of trigeminal neuralgia, all of which have been favorably influenced, though the time which has elapsed is so short (five months being the longest) that it would be premature to express any final opinion as to the efficacy of the procedure. Härtel is the first to advocate and put into practice the injection of the ganglion as a therapeutic measure, though it had been previously used for the purpose of anesthesia in a case reported by Krause,<sup>1</sup> and, as stated above, I am in the habit of shortening the period of general anesthesia by injecting the ganglion as soon as it has been exposed in operations for avulsion of the sensory root. Härtel's<sup>2</sup> technique has been most carefully elaborated and is based on very minute anatomical studies of the trigeminal distribution. He rejected the methods of Offerhaus and Ostwalt of approaching the region through the infratemporal fossa, partly because of the impossibility of insuring asepsis when proceeding through the mouth, and partly because the direction of the needle by this approach makes it impossible to completely penetrate the ganglion.

<sup>1</sup> PROGRESSIVE MEDICINE, 1913.

<sup>2</sup> Archiv f. klin. Chir., 1913, No. 1, vol. c.



Harris' transverse method is objectionable because of the possibility of injuring the cavernous sinus. The technique finally adopted by Härtel, has the advantage of being aseptic, of avoiding injury to the neighboring structures, and of affording ample space for puncturing the ganglion. Härtel found the foramen ovale to vary in length between 5 and 11 mm., and in width between 2 and  $7\frac{1}{2}$  mm. In form, it varies all the way from a small longitudinal slit to a circular transverse oval. When the width is less than 3 mm., the puncture is exceedingly difficult; this he found to be true in 8 per cent. of the skulls examined. Occasionally, it is not completely surrounded by bone. Härtel uses a special cannula 0.8 mm. thick, 10 cm. long, with a flat point and movable marker, with which the proper distance can be marked by means of an aseptic rule. The injection is made with a 2 cm. Record syringe.

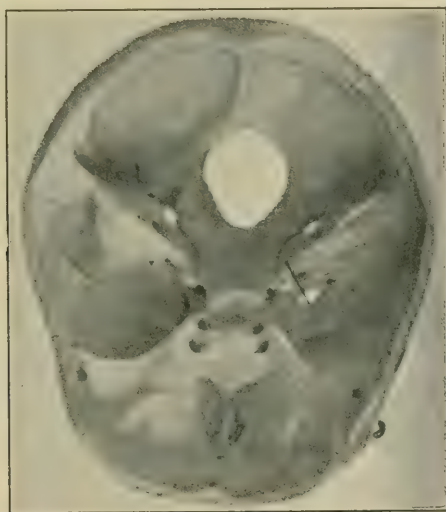


FIG. 1.—Photograph showing interior of the base of the skull with the cannula introduced through the foramen ovale. (Härtel.)

To reach the foramen ovale, the needle, with the marker adjusted to 6 cm., the distance to the planum infratemporale, is introduced into the cheek at the level of the alveolar margin of the second upper molar tooth (Figs. 1 and 2). In order to avoid perforating the mucous membrane, the index finger is placed in the patient's mouth to guide the cannula, which is directed between the ascending ramus of the lower maxilla and the tuber maxillare, around the buccinator muscle to the infratemporal fossa. Härtel has found that the direction of the needle should be such that when viewed laterally, the needle will point toward the articular process of the zygoma. If it points too far inward there is danger of injuring the Eustachian tube, while if it goes too far forward, there is the possibility of puncturing the jugular

foramen (Fig. 3). From the examination of many skulls, Härtel is convinced that the needle should be introduced about the second molar tooth (Fig. 4). When the foramen ovale has finally been reached by hugging the smooth, hard surface of the planum infratemporale,



FIG. 2.—Photograph showing the method of inserting the needle. (Härtel.)

the patient will experience pain in the distribution of the third division. At this point the marker is placed at 1.5 cm., the usual distance from the foramen ovale to the ganglion, and the needle is advanced in the same direction as before until there is pain in the distribution of the second division, which assures the operator that the ganglion has been



FIG. 3.—Photographs showing the direction in which the cannula must be introduced in order to reach the Gasserian ganglion through the foramen ovale. (Härtel.)

penetrated. The syringe is then attached and an injection of an 80 per cent. alcohol solution is made slowly, drop by drop, until from 0.5 to 1 c.c. have been injected. The entire area supplied by the trigeminal on that side is then rendered anesthetic. The injection of novo-

cocaine is recommended for mild cases, alcohol being reserved for the more severe. The disagreeable after-effects of nausea, headache, and dizziness have been found to be due to too large doses. Though there had been recurrence—and this only very slight—in but 2 of the 14 cases, the time which had elapsed when the report was issued, five months, is too short to serve as a guide as to the permanency of the results. Whether it will prove to be physiologically the equivalent of a gasserectomy remains to be seen, but as the danger of keratitis after injection of the ganglion is just as great as after the radical operation, Härtel feels that the injection treatment should be reserved for the more severe cases, and those which have proved obstinate to peripheral injections.



FIG. 4.—Drawing showing method by which a point opposite the second upper molar tooth was selected for the insertion of the needle. (Härtel.)

Loevy<sup>1</sup> has injected the ganglion according to Härtel's technique on forty cadavers, and once on the human subject, and has experienced practically no difficulties. His patient, a man, aged seventy-seven years, who had suffered severely with neuralgia of all three branches, could not possibly have undergone a radical operation on account of a bronchitis and arteriosclerosis. He injected 0.8 c.c. of alcohol directly into the ganglion, and four months after there had been no return of the pain, no keratitis, and the patient's general condition was much improved.

Just here I should like to refer briefly to a case of neuralgia of the second and third divisions in a woman, aged seventy years, who had suffered for over ten years, reported by Alexander and Unger.<sup>2</sup> After attempting Härtel's method of injecting the ganglion without success,

<sup>1</sup> Berlin. klin. Woch., 1913, vol. i, No. 7.

<sup>2</sup> Ibid., No. 4.



they performed a Krause operation for the exposure of the ganglion, and then injected the part of the ganglion corresponding to the second and third division with an 80 per cent. solution of alcohol, instead of removing the ganglion. Three months after the operation the patient was still free from pain, and the cornea was clear. The authors feel that in this way the dangers of the radical operation will be greatly lessened and the results equally effective. But here again we are not in a position to estimate the ultimate results. The length of the operation, they claim, would be shortened, as only that part of the ganglion need be exposed which corresponds to the branches affected.

I am quite willing to concede that the injection of the ganglion may prove to be a valuable substitute for general anesthesia in operations in the distribution of the trigeminal nerve. Even in this limited field, however, I believe the comforts of the patient will be better conserved by the use of ether anesthesia, as the injection of the ganglion is itself an extremely painful procedure and should be reserved for cases in which a general anesthetic is positively contra-indicated.

As regards the permanency of the effects of a single alcoholic injection, I am somewhat skeptical for various reasons. In the first place, the investigations of May (see *PROGRESSIVE MEDICINE*, March, 1913) would seem to indicate that complete necrosis or degeneration of the ganglionic tissue should not be anticipated from a single injection. Furthermore, I have found, in observations made on the cadaver with a stained fluid, that even under great pressure it is difficult to diffuse the fluid uniformly throughout the meshes of the ganglion. The fluid tends to escape in the direction of least resistance, and accumulate in the space between the ganglion and its envelope, the *dura propria*.

After exposing the ganglion, Alexander and Unger,<sup>1</sup> instead of being content with a single injection, punctured the ganglion in many places, and thus diffused the alcohol so widely that a greater portion of the ganglion was exposed to its effect than would be possible by a single subcutaneous injection. I doubt very much whether it will be possible to, in fact it seems highly improbable that one could ever, inject the sensory root, although were this possible we would of course have a much greater assurance against recurrence.

**The Facial Nerve.** **FACIAL PALSY.** One wonders not a little why the surgery of the seventh nerve has not progressed more nearly abreast with that of the fifth when one considers the esthetic gravity and the serious inconveniences of facial palsy and facial spasm, which, like the affections of the trigeminal nerve, have been found to be amenable only to surgical therapy. In the ten years and more which have elapsed since the first operation for facial palsy was performed by Ballance, followed closely by the experimental work of Manasse and operations by Faure and Furet, Kennedy, myself, and others, comparatively

<sup>1</sup> *Loc. cit.*

few cases have been reported. Whether this is due to the fact that the results have not been sufficiently brilliant, or because few patients have been willing to submit to the operation, it is impossible to say.

My experience in six cases has, on the whole, been very satisfactory. The ideal result, that is to say, the complete restoration of all the expressional movements, such as crying and laughing, is, of course, difficult to obtain. But the restoration of complete symmetry of the face in repose and of the coarser voluntary movements, such as lowering the eyelid, raising and lowering the corners of the mouth, is to be expected in every case in which a careful anastomosis has been performed and in which the paralysis was not too long-standing. In one of my cases function returned in the eyelid two and a half months after operation, and at the end of one year the patient was able to move the angle of the mouth, show his teeth, and whistle. With continued electrical treatment and massage, I feel confident that there will be a gradual return of the more delicate movements of expression. But, setting aside this consideration, the mere restoration of symmetry in repose in place of the unsightly disfigurement is sufficient, it seems to me, to warrant the undertaking of an operation which, however delicate, is not serious in the hands of one familiar with this field of surgery.

Few, I think, will agree with Jianu's<sup>1</sup> statement that the operation is not only unnecessary, but even harmful, made at the time he reported a new operation for facial paralysis, which he performed at the suggestion of Gomoïu. During the past year, Gomoïu<sup>2</sup> has described his myoplastic method for treating facial paralysis, which consists in anastomosing to the buccal commissure of the paralyzed side a fasciculus of the sternomastoid muscle. The technique is essentially as follows: An incision is made at the anterior border of the sternomastoid muscle, and the sternocleidomastoid exposed. The sternomastoid fasciculus is separated and detached from the cleidoöccipital for a distance equal to that from the mastoid to the place normally occupied by the commissure. The former muscle is cut at the point indicated and drawn outside the wound. With a bistoury, a subauricular tunnel is made to the labial commissure, and the muscle is drawn through. The commissure is then held in normal position by the transplanted muscle. Gomoïu has worked this out on the cadaver, and Jianu tried it in 1909 in a case of paralysis following extirpation of a tumor of the parotid, in which the immediate result was satisfactory. Gomoïu feels that it is indicated in all cases requiring surgical intervention, as it is easily executed and without the risk or the subsequent difficulties of the facio-spinal and the hypoglossal anastomoses. Indeed, he states that it is the only procedure to be recommended in cases of partial paralysis, as it usually improves the condition immediately, at least never makes

<sup>1</sup> *Deutsch Zeit. f. Chir.*, Bd. cii, Hft. 4-6.

<sup>2</sup> *Lyon Chir.*, 1913, Tome ix, No. 5.

it worse, and leaves no noticeable scar. To be sure, fascial status may be reëstablished, but it seems to me highly improbable that even the coarser movements can be restored, as the graft must necessarily remain more or less passive.

Stein<sup>1</sup> has tried without success Busch's method of passing a silver wire from the malar bone through the cheek to the corner of the mouth and back to its starting point, forming a sort of sling as it were, and has resorted to a fascia plastic operation, consisting in taking a flap from a healthy muscle in another part of the body and implanting it subcutaneously in the place of the paralyzed muscle, fastening it to the periosteum of the malar bone. Two or three weeks before the major part of the operation, he makes an injection of a small amount of paraffin to fill out the cheek on the paralyzed side. At the second sitting, he removes a piece of fascia about 20 cm. long and  $\frac{1}{2}$  cm. wide from the thigh. He then makes a  $\frac{1}{2}$  cm. incision to the inner side of the paraffin injection and above the corner of the mouth, and a similar one on the outside of the deposit of paraffin. By means of an incision above the malar bone, the latter is exposed for about  $2\frac{1}{2}$  cm., and, with this as a starting point, a bayonet-shaped needle is drawn through the cheek to the inner wound at the corner of the mouth. The strip of fascia is then fastened to the needle and drawn up through the cheek until an end appears in the upper wound. The other end of the fascia is then conducted through the subcutaneous canal to the incision at the corner of the mouth, and thence to the malar bone, where both ends are carefully sutured. Stein carried this procedure out on a patient with facial paralysis of five years' standing. One year after the operation, while complete symmetry of the face had not been restored, the deformity was scarcely noticeable. This seems to me scarcely more feasible than the myoplastic method and is much more complicated. The ultimate results will, in all likelihood, be much less permanent and less satisfactory than those obtained by anastomosis. I cannot recommend either of these procedures. In all cases in which an operation is indicated, the best results are to be obtained from nerve anastomosis.

This brings us to the second point, which has been raised by the communications of this year, namely, the *indications for operative intervention*. The prognosis of facial paralysis is indeed a point of difference among surgeons, and depends largely on the etiology and duration of the disease. In cases in which the nerve has been completely severed or irreparably injured, the operation should be undertaken without delay. In Bell's paralysis, however, spontaneous recovery is likely to occur within a few months. It is, therefore, wise to wait until about three months have elapsed. If, at the end of this period, there is no recovery of function in the facial muscles, an anastomosis should be performed without delay, as the earlier this is done the better the

<sup>1</sup> Münch. med. Woch., 1913, vol. lx, No. 25.



prognosis. This is especially true of paralysis consecutive to inflammation of the nerve following middle-ear disease. This form usually recedes spontaneously after opening and draining the antrum. In Poucet's clinic, 2 cases recovered, one forty-eight hours, the other fifteen days after operation. Bevers<sup>1</sup> reports a case of complete right facial paralysis which persisted for two months after a radical mastoid operation. He performed a facio-hypoglossal anastomosis which was followed by steady improvement. Twenty-one months after operation the face was symmetrical in repose, power to close the eye was restored, and there was a marked advance in the patient's power of emotional movement. Cotte and Sigaux<sup>2</sup> report a case of a young man, aged twenty-seven years, who had suffered from mastoiditis indefinitely. A year had been allowed to elapse between the drainage of the antrum and the facio-hypoglossal anastomosis. No improvement followed, as the inflammation had been of so long standing that regeneration was impossible. In these cases, it seems to me that sufficient time should be allowed to elapse to permit of proper healing of the wound and spontaneous recovery. If the latter does not take place at the end of three months, operation should be resorted to at once, except in those cases in which the suppuration was of such long standing or the drainage was so incomplete as to have allowed the propagation of the infection along the nerve, destroying all hope of functional regeneration, as was the case with the patient described by Cotte and Sigaux. Deanesly<sup>3</sup> reports two cases of facio-hypoglossal anastomosis for paralysis subsequent to the radical mastoid operation. Both were successful insofar as to restore the symmetry of the face in repose, though there has been no return of power of emotional expression.

**FACIAL SPASM.** Convulsive movements of the face—spasm, tic, and epileptic twitching—while painless in themselves, are disturbing, and a source of grave inconvenience. The latter are usually not difficult of diagnosis, as they accompany epileptic seizures, either general or focal in type, and can be cured or ameliorated by whatever will help the epileptic convulsions. It is with the first type, facial spasm, that we are especially concerned, since this form, being of peripheral origin, may respond to some direct means of treatment, such as alcoholic injections. Tic convulsive, or habit spasm, must be considered only for the purpose of elimination, for while both of these hyperkineas have certain superficial similarities, they are etiologically very different and hence require very different treatment. In each instance there is an intermittent, painless contraction of the facial muscles, but while tic is more or less a psychic condition, depending on the patient's mental state, facial spasm is believed to be the result of a definite lesion of the nerve and thus wholly beyond control, either voluntary or involuntary.

<sup>1</sup> *Lancet*, 1913, vol. clxxiv, No. 4683.

<sup>2</sup> *Lyon Chir.*, 1912, vol. viii, No. 6.

<sup>3</sup> *British Medical Journal*, May 17, 1913.

Psychotherapy and an effort on the part of the patient are practically the only means of inhibiting the former, while the latter may be helped by any treatment which tends to lessen the activity of the nerve.

The immediate relief which has followed alcoholic injection of the trigeminal nerve suggested the application of the same treatment for the relief of irritation of the seventh nerve, more especially as such other methods as nerve stretching and neurectomy had been so unsuccessful. Kennedy<sup>1</sup> reported a successful case of division of the facial nerve and anastomosis with the accessory for the cure of facial spasm, but I know of no one who has followed his example. The French physicians, Brissaud and Raymond, have used alcoholic injections to advantage, and Patrick introduced it in this country in 1907. Two out of 3 cases injected by the latter<sup>2</sup> were successful, with no recurrence of the spasm for six and eight months respectively. This is a comparatively simple method of treatment, and as the resulting facial palsy clears up in a short space of time, should be resorted to without apprehension. In one case which I injected, the paralysis disappeared in three months, and six months after the injection there had been no return of the spasm. This physiological phenomenon is carefully explained in an article by Campbell.<sup>3</sup> The lesion to the nerve has injured the neurones in such a way as to augment their explosibility. When impulses strike them, they are thus set into ceaseless spasms. When function returns a few months after the injection, the convulsive habit has been partially or wholly broken.

**The Surgery of the Auditory Nerve.** In spite of the fact that the auditory nerve is often exposed in operations on the posterior fossa, and in spite of the very encouraging results of surgery in the treatment of functional disturbances of the trigeminal nerve, it is only recently that the auditory nerve has come within the scope of surgical therapy.

**INTRACRANIAL DIVISION OF THE AUDITORY NERVE FOR PERSISTENT AURAL VERTIGO.** While intracranial division of the auditory nerve was proposed by Krause, in 1902, for the relief of intractable tinnitus, and since that time has been performed a number of times, the propriety of this procedure, I think, had not been considered in connection with aural vertigo until Dr. Mills discussed the question with me, in 1908, with regard to a patient then in the University Hospital. The following is a brief history of the patient whom he referred to me<sup>4</sup> for operation:

In 1899, when fifty-five years of age, the patient had an attack of influenza from which she recovered, complaining of "roaring" in the left ear, and about a month later she discovered that she was deaf. Two months after the attack of influenza, immediately preceding the onset of

<sup>1</sup> Quoted in Keen's Surgery, vol. ii, p. 730.

<sup>2</sup> Journal of Nervous and Mental Disease, 1909, vol. xxxvi, p. 1-10.

<sup>3</sup> The Practitioner, 1913, vol. xc, No. 6.

<sup>4</sup> Surgery, Gynecology, and Obstetrics, November, 1912.

her ailment, she began to complain of vertigo. The latter did not interfere with her sleeping, was mostly on the left side, but when sitting or standing she felt as though she were swaying forward, although she had never fallen. She always carries the head turned toward the right shoulder. The vertigo is increased upon exertion and when she lies on the right side. There has been no sensation as if her body were being moved, and there has been no objective vertigo. In addition to the vertigo, she complained of a roaring in the left ear like the noise of a sea-shell. There is no headache, no ataxia, no nystagmus, no involvement of muscles supplied by the seventh cranial nerve, and no impairment of pain or touch sense in the distribution of the trigeminal nerve.

After fully considering the gravity of the situation, the patient submitted to operation, which I performed on October 6, 1908, according to the following technique: Under ether anesthesia, with the patient in the reversed Trendelenburg position at an angle of 45 degrees, an incision was made as for a unilateral suboccipital craniectomy. The musculocutaneous flap was reflected downward, without much hemorrhage, except from an emissary sinus near the occipital protuberance. The bone was removed so as to uncover the left cerebellar hemisphere, to the left as far as the emissary vein, to the median line on the right, and above so as to expose the transverse sinus. The dural flap was turned down, and I at once proceeded to approach the auditory nerve, following the direction of the petrous bone as in exposure of tumors of the cerebellopontile angle (Fig. 5). The left cerebellar hemisphere was gently retracted with the handle of a teaspoon, which has proved in my hands the most convenient instrument for the purpose, and every precaution taken to prevent direct or indirect pressure on the medulla or pons. Finally, the internal auditory meatus was reached, and the eighth or auditory nerve exposed at its point of entrance (Fig. 6). With good artificial illumination, the auditory and facial nerves were identified. The auditory was readily separated from the facial nerve and divided with alligator scissors. An electrode applied to the facial nerve gave an immediate response. The dural wound was closed with interrupted silk sutures and the musculocutaneous flap restored. One year after the operation, it was reported that the vertigo had been partially, but not altogether, relieved.

The selection of cases, for which this operation is indicated, is a matter of considerable importance. If possible, those cases of tinnitus or vertigo of central origin must be excluded. The most appropriate cases are those in which the disease is labyrinthine in origin; it may originate in the cochlear ganglion, in the vestibular ganglion, or in both, but as there is no means of separating the cochlear from the vestibular division, the auditory trunk must be divided. The most promising cases are those in which there is marked loss of air conduction, with preservation of bone conduction, cases with definite cochlear lesions, in which the tinnitus is low-pitched and of varying character.



While the exposure of the auditory nerve should not be a difficult procedure to one accustomed to operating in the posterior fossa, it should never be intrusted to those who are not familiar with the prob-



FIG. 5.—Suboccipital unilateral craniectomy, showing the relative position of the incisions in the skin and musculo-aponeurotic layer to the opening in the skull and dura. *s*, Heidenhain hemostatic suture to control hemorrhage from the superior margin of the incision; *a*, cutaneous incision half an inch above *b*, an incision in the musculo-aponeurotic layer; *c*, margin of bony opening; *d*, dura; *e*, mastoid emissary vein.

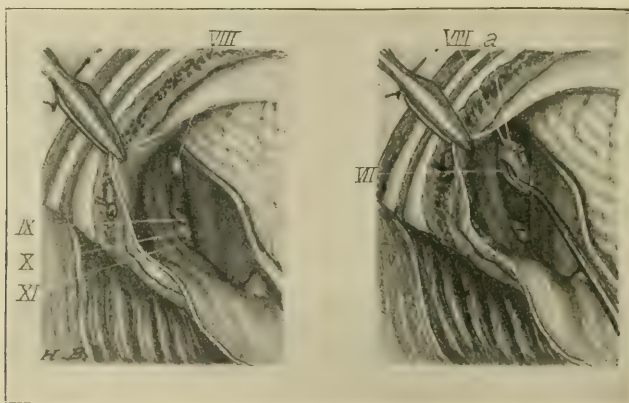


FIG. 6 (left figure).—Illustration showing the retraction of the cerebellar hemisphere and the relation of the auditory nerve at the internal auditory meatus to the glossopharyngeal, pneumogastric, and spinal accessory nerves. Note that in this illustration the facial nerve is entirely concealed by the auditory nerve. Right figure: Here the facial nerve (*vii*) has been separated from the auditory nerve (*viii*) by a blunt hook.

lems of this region, no matter how skilled they may be in other fields. Control of hemorrhage, for instance, must be effected in quite a different way from the methods used in pretentorial operations. I have found a continuous overlapping suture introduced a half inch above the incision to be most effective. Hemostats may be applied to control bleeding along the inferior margin. Bleeding from the numerous emissary veins is sometimes so troublesome as to require plugging the openings in the bone with wax or even with wooden pegs. The position of the patient is an important point in these operations. He should lie on his side or his face, with the head flexed. The intratracheal method of administering anesthesia has here removed the gravest difficulty, namely, the danger of respiratory failure.

INTRACRANIAL DIVISION OF THE AUDITORY NERVE FOR PERSISTENT TINNITUS. It was not until 1902 that the division of the auditory nerve was suggested by Krause as a therapeutic measure in the treatment of persistent aural tinnitus, and since that time only ten cases have been reported. Usually tinnitus aurium will respond to local treatment, but not infrequently the trouble becomes intractable, even to the point of being the cause of attempted suicide.

At the meeting of the American Medical Association, in June of last year, I<sup>1</sup> reported a case which had recently come under my observation. The patient, a young man, aged thirty-four years, was sent to my clinic at the University Hospital by Dr. L. C. Suttner, of Walla Walla, Wash. He had been struck on the head by a falling tree, and upon regaining consciousness, there was, in addition to a severe ringing in his right ear which persisted until his health was being impaired, also impairment of sensation in the distribution of the trigeminal nerve, and complete loss of vision on the affected side. There probably had been a fracture of the base of the skull, but the associated injury of these three nerves is very unusual. The operation which I performed for the relief of his tinnitus was in all essential features like the one above described, which I did for aural vertigo (Fig. 7). The convalescence was uneventful, except that it was prolonged by an attack of appendicitis. The effects of the operation were more than gratifying to the patient, as the intense roaring sound had entirely disappeared.

The proper selection of cases of tinnitus differs little from that of vertigo. When vertigo alone is present, some benefit may be derived from the removal of the semicircular canals, but the operation will in no way affect the tinnitus.

The question has been raised as to whether certain forms of persistent otalgia might not be benefited by this operation. If, as Hunt maintains, there may be, in certain cases of persistent otalgia, a neuritis of both the seventh and eighth nerves, it would be necessary to divide

<sup>1</sup> Journal of the American Medical Association, vol. lxi, pp. 327-329.

them both. This would, of course, simplify rather than complicate the technique. While the inevitable facial palsy might be considered an insurmountable objection, the patient, might prefer the resulting facial asymmetry to the persistent pain.

I cannot but feel that intracranial division of the auditory nerve has a sound physiological basis, and that its performance is justified in carefully selected cases.

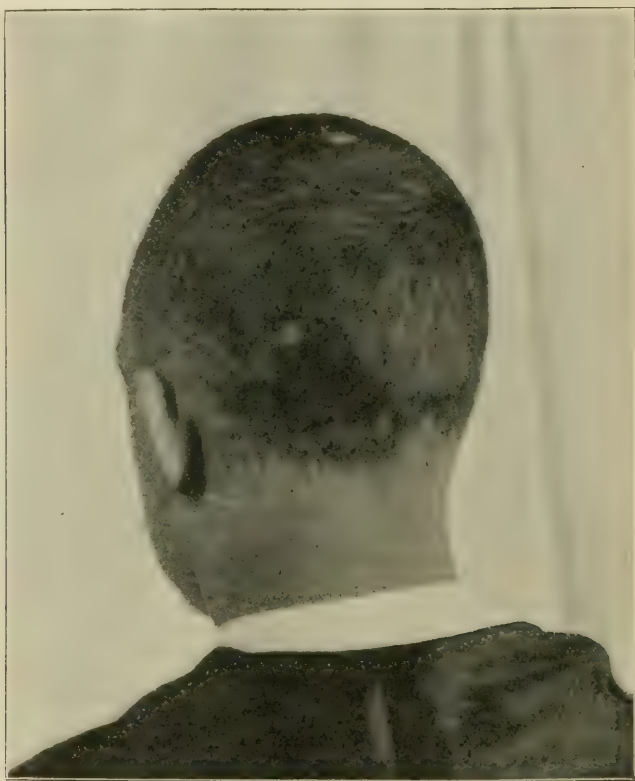


FIG. 7.—Photograph of patient taken two weeks after operation, showing scar well concealed within the hair line.

Dench<sup>1</sup> has reported a case of a man, aged forty-two years, upon whom he operated for severe tinnitus and vertigo of four years' standing. The patient was practically deaf on the right side, but hearing was normal on the left. He was almost in a state of nervous collapse. Dench performed the operation in two sittings, a week intervening. A musculocutaneous flap was reflected in the right occipital region and a gouge applied just below the superior curve line of the occipital bone.

<sup>1</sup> Interstate Medical Journal, 1912, vol. xix, pp. 29-34.



The opening was then enlarged with rongeur forceps and the cerebellar dura uncovered. At the second sitting a dural flap was reflected, and the cerebellar hemisphere drawn toward the median line and elevated. The nerves were carefully differentiated, and the auditory divided, the central end of the latter being pulled out from its central attachment by means of forceps.

**DECOMPRESSION FOR RELIEF OF DISTURBANCES OF THE AUDITORY APPARATUS OF INTRACRANIAL ORIGIN.** While the beneficial influence of compression for the relief of edema of the optic nerve with failing vision is now a well-established fact, so far as I know it has not been thought of in connection with aural disturbances until Eagleton<sup>1</sup> reported three cases in which he did a decompression for the relief of the latter symptoms. Just as recent research has shown, there is probably some factor in the etiology of papilledema other than cerebral edema or edema of the nerve sheath, so deafness associated with intracranial tumor may be due to some cause other than neuritis and edema of the auditory nerve. Nevertheless, it is quite possible that by relieving the undue amount of pressure on the acoustic nerve, the disturbance in hearing may be greatly alleviated. Unfortunately, we have no means of detecting edema or neuritis of the acoustic nerve in its early stages as we have in the case of the optic nerve. It is present, nevertheless, in many cases of subtentorial lesions, and Eagleton's experience would seem to justify a palliative operation in all cases in which the disturbance is recognized in its early stages. His cases are briefly as follows:

**CASE 1.**—Case of brain tumor associated with total deafness of both ears and non-excitability of both vestibular apparatus; decompression; temporary restoration of hearing in one ear, the vestibular apparatus remaining non-excitabile.

**CASE 2.**—Case of probable tumor of the acoustic nerve sheath; decompression; temporary disappearance of all retro-labyrinthine vestibular symptoms.

**CASE 3.**—Case of increased intracranial pressure of unknown origin, probably tumor of the cerebellum, presenting vertigo—sensation of pressure on top of the head contracted and interlacing color fields, cerebrospinal fluid under pressure—with which was associated progressive deafness, ending in total deafness in left ear, and beginning deafness in right. Decompression, followed by entire relief of all general symptoms, with partial restoration of hearing in left ear and complete restoration in right ear.

**Trauma. FRACTURES OF THE SKULL.** We have had occasion in previous numbers to comment on the propriety of temporal decompression as a remedial measure in cases of serious cerebral contusion attending fracture of the skull, and have taken the stand that the operation is indicated only in a few selected cases, and not, as sometimes advised,

<sup>1</sup> The Laryngoscope, 1913, vol. xxiii, No. 5.

as a routine procedure (for previous discussion see PROGRESSIVE MEDICINE, March, 1913, p. 49; March, 1911, p. 34; March, 1911, p. 79). We would not bring the subject up again but for the appearance of an article by Homans,<sup>1</sup> who expresses his views as to the indications for operation as follows:

"If the patient, when seen from six to twenty-four hours after injury, shows a slow pulse, rapid and irregular or shallow respiration, low blood-pressure, a temperature of 103°, or over, bright, bloody fluid on lumbar puncture and deep unconsciousness, I am not inclined to operate, because I feel that I shall gain nothing. Up to this condition, I operate on every case at once, provided the case demands any surgery. I think that it is right to watch any case through its early abasement and possibly deceptive recovery if I am prepared to operate at any minute. That is to say, I should carefully observe most cases seen in the first few hours, but if the patient does not soon improve, or becomes worse, I operate at once. In a case of doubtful progress, I should feel happier to have operated than to have let the patient drag along for days fluctuating between better and worse."

Homans states that in a certain group, as above defined, he declines to operate because nothing is to be gained by surgery. He goes on to say that with this exception, or, as he says, "up to this condition," he operates in every case "provided the case demands any surgery." The latter phrase does not make clear to the reader what he regards as the indications which "demand any surgery." After all, this is the crux of the whole situation, the indications for operation and his views, to admit of discussion, require greater amplification. But he covers this point in a sweeping way by stating that *in the first few hours* if the patient does not *soon* improve, he operates at once. To this general statement the objection might be advanced that there are many cases which show little improvement for several days after the injury, and, providing then the signs of medullary disturbance are not increasing, there are no substantial grounds for interfering. As a matter of fact, the cases of cerebral injury under discussion may be divided into three groups: (1) Those which are serious from the beginning rapidly grow worse and die from six to twenty-four hours after the injury; (2) those less grave which exhibit their most serious phase in the first twenty-four hours, but, after several days of more or less profound unconsciousness, gradually improve; and (3) those which, at first without apparent fatal tendencies, later exhibit signs of serious medullary disturbance that may be relieved by operation. In the latter group alone—and it comprises only the minority—is operation justifiable.

In the Massachusetts General Hospital, during 1911-12, there were 11 cases of fractures of the base, all but one of which appear to have

<sup>1</sup> Med. Communicat. Mass. M. Soc., 1912, vol. xxiii, p. 213.

been bursting fractures. Of these, 2 were not operated on, with one death. Of the other 9, 5 recovered and 4 died. Or, out of 11 cases, 6 recovered and 5 died.

Assuming that the nine were operated upon (although the number is far too small from which to draw conclusions of value) the mortality was 45 per cent. This is not very much below the mortality of basal fractures taken from large series of less recent times in which no attempt was made to relieve the condition by decompression.

Grosshart<sup>1</sup> has recently reported 15 cases of fracture of the skull. The cases not operated upon died; of the 13 cases operated upon there was 1 death; of the 12 who recovered, 1 developed epilepsy six years after the operation. In cases presenting unconsciousness, vomiting and loss of reflexes, he has come to the conclusion that operation should not be delayed if there is no improvement at the end of forty-eight hours. This is a much sounder recommendation than Homans', and a reasonably safe one to be followed by the inexperienced surgeon, although here again I believe greater discrimination should be used in the selection of cases.

Burnham<sup>2</sup> has tabulated the results in 35 cases of compound fractures of the base treated at the Presbyterian Hospital in New York during the past five years. Of these, there were 14 deaths, or a mortality of 40 per cent. Six deaths occurred during the first forty-eight hours in primary shock from the injury. Of the other eight deaths, 5 were due to meningitis, 2 on the fourth, 2 on the sixth, and 1 on the thirteenth day; and 2 occurred on the fourth day from pneumonia, and 1 on the tenth day from secondary hemorrhage. These cases all presented the classical picture of fracture of the base, with bleeding from the ears, nose, and mouth. Magruder<sup>3</sup> advocates drainage nearest the lesion by means of an osteoplastic flap or an inter-musculo-temporal operation. Drainage through the bone or split muscle, rather than through the scalp alone, will minimize the possibility of hernia cerebri.

Chiarugi<sup>4</sup> recommends lumbar puncture as a therapeutic measure in cases of cerebral trauma. He recently resorted to this procedure in 36 cases—10 basal fractures, 5 fractures of the vault, 18 cerebral contusions, and 3 contusions. Three cases of fracture of the base and one of the vault terminated fatally. Its efficacy lies, first, in relieving important nerve centres of the effects of compression, and, secondly, in favoring union by preventing the escape of blood and fluid through the line of fractures. In cases in which the injury is slight, headache and vertigo usually will disappear after the first puncture. In cases demanding surgical intervention, a preliminary lumbar puncture is helpful.

<sup>1</sup> Journal of Oklahoma State Medical Association, 1912, vol. v, p. 6.

<sup>2</sup> Boston Medical and Surgical Journal, 1913, vol. clxix, p. 8.

<sup>3</sup> Loc. cit.

<sup>4</sup> Quoted in Journal de Chir., December, 1912.



*Depressed Fractures of the Skull.* Hoffmann<sup>1</sup> has recently reported a case of depressed fracture in the left parietal region in a boy, aged ten years, who came to him for operation three months after the injury. The depression had caused weakness of the muscles of the face, and some paralysis in the right extremities. In order to relieve the pressure symptoms and restore the normal convexity of that portion of the skull, an incision was made over the site of depression down through the periosteum, and a flap reflected. A three-quarter circular flap was then constructed from the underlying bone, the base of the latter flap broken, and the piece of bone inverted, and replaced. The normal contour of the skull was restored, the flap healed by first intention, and the pressure symptoms disappeared.

Kosmak<sup>2</sup> has contrived a new instrument for raising depressed fractures of the skull in the newborn. It is very similar to the hook of a double tenaculum forceps. The handle, which is large enough to be easily grasped, is provided with a short hook at right angles to the shank. The point of the instrument can be forced into the midpoint of the depression through the inner table of the skull without any difficulty by a firm, steady pressure. The handle is then turned at right angles to the surface, and the depressed bone elevated by means of a steady pull. Kosmak has used this device successfully in three cases.

*Removal of a Bullet Lodged near the Fourth Ventricle.* In a case of attempted suicide referred to Exner and Karplus<sup>3</sup> for treatment, the roentgenogram showed the bullet to be lodged 2 to 3 cm. below the corpus callosum near the posterior end. There was some paralysis of the extremities and severe headache. The region of the third and fourth ventricles is still considered very difficult to approach. They made use of a technique worked out by Karplus and Kreidl<sup>4</sup> on monkeys, dividing the operation into two stages. At the first sitting, an osteoplastic flap about the size of the hand was reflected, extending from a point 2 cm. to the left of the median line back far enough to expose the occipital lobe and forward up to the outer canthus of the eye. At the second stage, the dura was incised along the edge of the osseous flap, and, upon raising the brain, the corpus was visible. A median incision 3 cm. long was made in the latter, and, on the anterior part to the left of the median line and against the third ventricle, a bluish tumor was exposed, in which the bullet was embedded. The cyst was incised and the bullet removed, the occipital lobe was replaced and the dura and skin sutured. The patient did not regain consciousness, and died one hour later. Although the operation is reported as being devoid of technical difficulties, it appears to me as a rather formidable procedure, and the outcome not altogether surprising.

<sup>1</sup> Zentralbl. f. Chir., 1912, vol. xl, No. 28.

<sup>2</sup> American Journal of Obstetrics, 1913, vol. lxxvii, No. 422.

<sup>3</sup> Wien. klin. Woch., 1913, vol. xxvi, No. 28.

<sup>4</sup> Zeit. f. biol. Technik und Methodik, 1912, Bd. 2, Hft. 7.

INTRACRANIAL HEMORRHAGE IN THE NEWBORN. The etiological relation between intracranial hemorrhage of the newborn and epilepsy, the various forms of Little's disease, porencephalus, and other degenerative changes of the cortical surface of the brain is now a well-recognized fact, but whether or not operative intervention will in many cases prevent the sequelæ is a point which has not as yet been established by any report that has been brought to my attention. The pathological findings in many of these cases show that the cortex of the brain, compressed by the hematoma, has undergone sclerosis, atrophy, or softening. Oftentimes pachymeningitis hemorrhagica interna and porencephalus have developed.

In a symposium on Birth Traumata at the Virginia State Medical Association, in October, 1913, I<sup>1</sup> considered this subject quite at length.

The crux of the whole situation, insofar as concerns surgical intervention, it seems to me, lies in the determination of the location of the hematoma. A definite advance was made in this direction when the symptom-complex concomitant to peribulbar or subtentorial hemorrhages was differentiated from that which we have come to associate with the pretentorial variety. Accompanying the latter we find extreme restlessness and spasms, rigidity of the extremities, epileptic-like twitchings of the face, arms, and legs, lowered pulse and respiration, rapid rises in temperature, increased reflexes, bulging of the fontanelles, and widening of the lambdoid suture, narrowing, and later widening, of the pupil on the affected side (in cases of unilateral hemorrhages), and in some cases paralysis of the facial, hypoglossal, and accessory nerves, subconjunctival and palpebral hemorrhages, edema of the eyelids, and proptosis. The child cries and screams almost ceaselessly, and for no apparent reason. This inexplicable screaming is pathognomonic, and is due probably to dural tension. Hemorrhages in this locality are more easily recognized than those situated below the tentorium by the disturbances of the cortical motor region. In pretentorial lesions, lumbar puncture is of no avail as a diagnostic measure, but puncture of the subdural space through the outer corner of the large fontanelle is often of positive value. With the peribulbar type, the baby is usually in a somnolent condition, with cyanosis of the face, head, and hands, pulsating fontanelles, irregular breathing, and sometimes convulsions. In these cases a lumbar or cervical spinal puncture will usually elicit signs of hemorrhage. Abels<sup>2</sup> has recently described two cases of intrapartum ventricular hemorrhage which have come under his observation. He feels that the differential diagnosis between intracranial hemorrhage and tetanus is extremely difficult, the main difference being the absence of rigidity of the back of the neck and

<sup>1</sup> Virginia Medical Semi-monthly, 1913, vol. xviii, No. 426.

<sup>2</sup> Archiv f. Gynäkol., 1913, vol. xcix, No. 1.

opisthotonos in hemorrhage, and the earlier development and increasing intensity of trismus.

Of considerable moment in the differential diagnosis between infra- and pretentorial hemorrhages is the time at which the symptoms first manifest themselves. In the latter, there may be an interval of several hours or several days of freedom from symptoms, whereas in peribulbar hematoma the influence of pressure appears more abruptly and at shorter intervals. To be sure, there are exceptions to this general rule, but when one sees a case in which asphyxia is an early and conspicuous symptom, and blood-stained fluid is recovered on spinal puncture, the evidence is strongly presumptive of hemorrhage in the posterior fossa, whereas the presence of motor phenomena, rigidity, convulsive seizures, often of unilateral distribution, is significant of hemorrhage over the hemispheres. The greatest confusion will arise when hemorrhage from both sources is present, and under these circumstances the picture of one may obscure that of the other.

It is not alone sufficient, however, to distinguish between pre- and subtentorial hemorrhage, but also to ascertain whether, in pretentorial cases, the hemorrhage is unilateral or bilateral. For diagnostic purposes, the use of the exploratory needle and cannula may be of the greatest service, and I am inclined to believe that in all suspicious cases one should resort both to lumbar puncture and to puncture of the subdural space, not on one but on both sides. This may be readily done by introducing the needle at the outer angle of the anterior fontanelle, first on one, then on the other, side, directing the needle backward beneath and parallel to the parietal bone; if this be attended with negative results, one should puncture through the posterior fontanelle. Bear in mind, however, that a negative result does not always indicate the absence of hemorrhage, as when the hematoma is firmly clotted one fails to recover blood-stained fluid.

No matter what method be adopted for the relief of this condition, the mortality will of necessity be high. While all cases originate in the hands of the obstetrician the majority remain there, and the surgeon is seldom called in. Though a small percentage of cases have recovered following more formidable procedures, the first and foremost indication is to relieve pressure, and an attempt to do this should be made at once with the needle. In subtentorial hemorrhage, aspiration may be most effectively practised between the second and third cervical vertebrae, and, when the blood is still fluid, the results are exceptionally good. In pretentorial hemorrhages, an attempt at least should be made to relieve the symptoms by aspiration, and the necessity for a resort to a formal craniotomy may be altogether arrested. The fact, however, that in many cases the hematoma is too firmly clotted for aspiration and the fact that the source of hemorrhage is still uncontrolled often necessitate further intervention. This consists in the reflection of a flap,



so outlined as to uncover the central fissure, of sufficient dimensions to enable the operator to determine the size and extent of the hematoma. After the removal of the clot, the source of hemorrhage should be ascertained, and suitable measures adopted for its control. Ligation of the pial vessels is a matter of considerable difficulty, particularly in infants, and I have used with signal success, and with great satisfaction, the application of a small sliver of muscle to the bleeding point. This will control hemorrhage of this origin in a few seconds almost inevitably. Of the cases recorded in literature, Henschen<sup>1</sup> estimates the immediate operative mortality at 56 per cent. This, however, should not be considered prohibitive in a lesion which is of itself either fatal or attended with grave sequelæ.

**Malformations and Deformities.** MENINGOCELE. Kondring<sup>2</sup> has recently operated successfully on a baby with a large basal sphenoorbital meningocele, who died, however, three months after the operation. There was nothing abnormal about the birth, and the family history was negative excepting that one sister was deaf and dumb. The baby presented a huge tumor, measuring about 54 cm. in circumference, and occupying the entire right side of the head. It was perfectly opaque, without pulsation or fluctuation, though the size was increased by violent screaming. A diagnosis of meningocele was made, proceeding in all probability from either the lateral fontanelle or the orbit. The wall, composed of muscle and fascia and some bone, was quite thick; the overlying scalp was under great tension, and the zygoma was sprung into two parts. The jaws were distorted, and there was a quite decided strabismus. On account of the extreme tension and threatening ulceration and infection, Kondring decided on a radical operation, which was performed somewhat as follows: In order to injure the muscles and facial nerve in the wall of the tumor, as little as possible, a curved incision with its concavity forward was made beginning over the right eye and extending horizontally to the upper part of the pinna, passed down in front of the ear to a point opposite the angle of the lower jaw, and from this point proceeded 4 cm. forward. With a longitudinal incision from the bottom to the top in the direction of the fibers of the temporal muscle, the tumor, which contained a clear yellow fluid, was opened. It extended deep under the base of the skull behind the pterygoid process. In front of the pterygoid process and at the bottom of the exposed orbit was a fistula from which slowly trickled a clear fluid. The epithelial lining was scraped and cleansed with alcohol, and as much as possible of the serous lining of the tumor was removed. The malar bone was restored to its normal position, and the wound was closed. The child made a good recovery. The face remained a little asymmetrical, the right upper jaw and zygoma being prominent,

<sup>1</sup> Archiv f. klin. Chir., 1912, Bd. 98.

<sup>2</sup> Monatsschrift. f. Geburtshülfe u. Gyn., 1913, vol. xxxviii, No. 2.

and there was some strabismus. But the condition was much improved—there was no exophthalmos, the lids would close, the mouth was in the median line, and the upper jaw closed exactly on the lower. Three months later, however, word was received from the mother that the child had died after a short illness with spasms and vomiting, and, unfortunately, no autopsy was secured. Kondring thinks, however, that death was due to hydrocephalic process.

**STEEPLE SKULL.** Though the ophthalmologist has been interested in the deformity known as steeple skull for sometime, it is only recently that it has claimed the attention of surgeons. Since the cause of this malformation is the premature ossification of the bones of the skull, particularly in the region of the sagittal and coronary sutures, it is seldom congenital, but develops rather in early life between the first and sixth years. Out of twenty blind children with steeple skull, Meltzer<sup>1</sup> found that the condition was congenital in only one instance, though the skull had been unusually tall at birth in 12 cases. During the past year, Küttner<sup>2</sup> has reported 2 cases he has seen in which the growing together of the bones took place before birth. In one of the cases, a boy of one year and two months, the deformity was very extreme, and there was marked exophthalmos from the shallowness of the orbits. On account of the severe pressure, he did a decompressive operation, but the child died of pneumonia. Postmortem examination showed that there was an internal hydrocephalus. No operation was indicated in the second case. In these cases there is always danger of atrophy of the optic nerve caused by compression, which, in many cases, may be prevented by a decompressive operation. When hydrocephalus is present, appropriate measures must be adopted for its relief. We cannot at the present time pass final judgment on the "canal operation" which Schloffer<sup>3</sup> has proposed and carried out in two such cases—one having been improved and the other was only very recently operated upon. He seeks to lessen the pressure on the optic nerve by enlarging the bony canal. At the first sitting, a large osteoplastic flap is reflected from the forehead; at the second, the frontal bone, together with the dura, is elevated, and one proceeds between the bone and the dura to the optic foramen. Then the roof of the optic canal is carefully removed, the brain replaced, and the flap closed. This is, as Schloffer himself says, a serious operation for a child to undergo, and the possible danger to the nerve from manipulations on the roof of the canal should not be minimized. The procedure should, therefore, be considered only after decompressive measures have failed to bring relief.

Though Anton and v. Bramann have recommended puncture of the corpus callosum in cases of steeple skull and used this method of relief

<sup>1</sup> Neurol. Zentralbl., 1908, Bd. 27, p. 562.

<sup>2</sup> Münch. med. Woch., 1913, vol. lx, No. 40.

<sup>3</sup> Verhandlungen der Deu. Gesellschaft f. Chir., 1913.

of pressure in one case in 1908, a review of the literature on the subject and observation of cases make it evident that the symptoms of intracranial pressure are only occasionally due to increase of fluid, while in most instances an enlargement of the brain itself is responsible. Schumacher<sup>1</sup> found 6 cases of steeple skull, with autopsy reports. In the 4 cases in which the condition of the brain was recorded, the ventricles were distended in only one instance. He punctured the corpus callosum, according to Anton's technique, in a case of steeple skull in a boy, aged five years. Only a few drops of a slightly bloody fluid were recovered, and the child died on the fifth day. The autopsy revealed no abnormal widening of the ventricles, but the brain had increased greatly in size and in some places spontaneous perforation of the skull had taken place. Schumacher believes that only in rare cases, when there is the complication of an internal hydrocephalus, will puncture of the corpus callosum be effective in combating the symptoms of intracranial pressure accompanying steeple skull. In the great majority of cases, much more favorable results are to be hoped for from decompressive trephining.

**ANOMALIES OF THE TEMPORAL BONE.** I should like to call attention to a preliminary report by Freligh<sup>2</sup> on "Anomalies of the Temporal Bone at Birth," based on a careful investigation of 150 cases. While this is of prime importance to the aurist, certain points which he brings out may be of use to the neurological surgeon, as he is called upon more and more frequently to operate in cases of congenital deformities of the head.

**Repair of Defects in the Skull.** Of the various methods devised for the repair of cranial defects caused by operation or disease, I have adopted the König-Müller method and have not as yet seen any disadvantages, but, on the contrary, have had admirable results. Röpke<sup>3</sup> objects to the König-Müller method because of the possibility of adhesions, and recommends the substitution of a fragment of bone with periosteum on both sides, preferably one of the flat bones taken from the patient. This is an excellent suggestion, and should, I believe, be given preference to any other method. A fragment of the scapula meets all the requirements, and its removal does not affect the function of the arm, if it is taken from the centre and the muscles left intact. Should the defect be very large, several pieces can be used for the transplant. Röpke repaired a defect in the frontal bone,  $3\frac{1}{2}$  by 5 cm., in this manner. The graft healed in by first intention, and the defect in the scapula caused no ill effects.

Kleinschmidt<sup>4</sup> prefers to use a fragment from the tibia for the repair of simultaneous bone and dural defects. He did this in one case one

<sup>1</sup> Münch. med. Woch., October, 1912, vol. lix.

<sup>2</sup> Bull. Lying Hospital, 1913, vol. ix, p. 3.

<sup>3</sup> Zentralbl. f. Chir., 1912, vol. xxxix, No. 35.

<sup>4</sup> Ibid., No. 43



and a half years after the removal of a perithelioma of the dura. He removed from the tibia a periosteum flap the width of the tibia and twice the length of the cranial defect, leaving a layer of bone attached to the upper half. The lower piece of periosteum is then folded back over the free surface of the bone, and the flap thus formed, with periosteum on both sides, is applied to the defect in the skull. The wound healed throughout by first intention, but it is impossible to speak of the end-results, as the tumor recurred in several months. There were no untoward results from the defect made in the tibia. When a very large defect is to be repaired, flaps may be removed from both tibias. Kempf<sup>1</sup> has successfully transplanted a periosteum bone flap from the tibia to cover a defect caused by trauma and an extradural abscess, the result of the trauma.

In a short communication, Berndt<sup>2</sup> recommends the use of simply a periosteum flap in the repair of defects according to the König-Müller method, one, two or three flaps being used, depending on the size of the defect.

Karplus<sup>3</sup> has experimented on animals and on the cadaver, and has devised a method of plugging gaps in the base of the skull with rubber which has been moulded to fit the defect. The edges of the bone are dried with a thermocautery, and the plug is soldered in place by the same procedure. Karplus believes this method will be especially effective, since the plug can be punctured or removed at any time. His experiences on animals have been quite satisfactory.

Still another device for filling gaps in the skull has been described by the Greek, Anastassiades.<sup>4</sup> The patient had eleven days before received an injury in the temporal region caused by a shell. The brain herniated through the opening so that there was a prolapse almost the size of a hen's egg, and nothing was of any avail in controlling it. The patient was in a profound stupor. Finally, Anastassiades devised a stopper by bending a round of sheet lead over a metal cylinder so that the depression in the centre was just large enough and deep enough to fit into the cranial defect. This was sterilized and applied between sheets of gauze, two holes being bored in the cap to provide for drainage. The cap was made gradually smaller as the wound healed. This procedure has been repeated in two other cases with equally good results.

Another rather interesting contribution to the repair of cranial defects has been made by Smythe<sup>5</sup> in the shape of a preliminary report on some experimental work he has done on autoplasmic bone grafts. He is very much against the use of foreign materials or even bone from

<sup>1</sup> Archiv f. klin. Chir., 1913, vol. cii, No. 1.

<sup>2</sup> Zentralbl. f. Chir., 1912, vol. xxxix, No. 48.

<sup>3</sup> Wien. klin. Woch., 1912, vol. xxv, No. 8.

<sup>4</sup> La grèce Médicale, 1913, vol. xv, Nos. 17-18.

<sup>5</sup> Arkansas Medical Society Journal, 1913, vol. x, No. 5.

other species. Even when the bone is taken from the same person, there are failures when the graft is large. This, Smythe thinks, is due to lack of vascularization, the flap dying before sufficient new vessels can be produced. To obviate this difficulty, he has devised a method of making, with a saw, a series of cuts through the outer plate down to the cancellous tissue about one-quarter to one-third inch apart and a second series at right angles to the former. Blood and serum are thus allowed to flow into the cuts, new vessels are thrown off, and the danger of infection is greatly diminished. The graft becomes a number of small units, and sufficient nourishment is thus given to the osteogenetic elements to reproduce bone. A transplantation carried out on a dog, November 17, 1912, has proved entirely successful. A later report will embody a series of cases in dogs and three in the human subject.

As further argument against the use of metal plates is the result in a case reported by Turner.<sup>1</sup> The patient has received a glancing blow on the head, and a piece of bone the size of the palm was removed from the parietooccipital region, exposing a considerable area of the brain. A large flap was reflected and a metal plate was fixed in the opening by means of three screws. In eight months the screws loosened, allowing the plate to drop. Necrosis occurred at the lower angle and the plate had to be removed.

**Plastic Operations on the Dura.** The technique for plastic surgery of the dura is gradually becoming perfected. Methods employing alloplastic material are being pretty generally discarded, as indicated by Smirnoff<sup>2</sup> in his very excellent review of the subject, preference being given to homoplastic materials for the repair of these defects. Smirnoff reports the results of 74 experiments on dogs and rabbits in which heteroplastic material was used, the best results being obtained from the application of fish bladder and human peritoneum. The implant was slowly absorbed, and connective tissue developed around it. When the cortex was uninjured, no adhesions developed between it and the graft in most instances, but where injury to the cortex had occurred, adhesions were observed. If dural defects are to be repaired at all, it seems to me that the transplantation of fascia lata is to be the procedure of choice in the future. I referred last year<sup>3</sup> to the experiments of Kirschner and v. Saar and to the success with which the method had already been used by Körte and Denk, of v. Eiselsberg's Clinic. The latter's technique was described in detail. Denk<sup>4</sup> has now proceeded in this manner in 19 cases, but his results are not altogether satisfactory. Though 40 per cent. were not satisfactory, Denk feels that not the method, but

<sup>1</sup> British Medical Journal, September 14, 1912.

<sup>2</sup> Plastic Closure of Dural Defects, St. Petersburg, 1913; abstract in Journal de Chir., 1913, vol. ii, p. 709.

<sup>3</sup> PROGRESSIVE MEDICINE, March, 1913, p. 48.

<sup>4</sup> Archiv f. klin. Chir., 1912, vol. cxix, No. 4.

the technique, was at fault. Out of the 19 cases, there were 4 deaths from shock and 3 from meningitis. In 3 cases, a fistula was formed, and, in 4 cases, prolapse followed operation, in two instances so extensive that, combined with meningitis, it caused the patient's death; while 9 cases healed by first intention. In the 12 cases which recovered, attacks did not recur for periods of two years, thirteen, eleven, three, and one month. In 7 instances the attacks persisted, but were no more severe than before the operation. If care is taken to lap the fascia on the dura, both hernia and fistula will usually be prevented. Smirnoff reported 2 cases of traumatic epilepsy in which he successfully repaired dural defects in this manner. Neudörfer<sup>1</sup> used a fascia graft in a case of inferior occipital meningocele in a child four months old. The wound healed by first intention, but not sufficient time had elapsed to speak of the ultimate results. At the German Surgical Congress in 1912, Rehn<sup>2</sup> advocated the use of fatty tissue rather than fascia lata. In a case of Jacksonian epilepsy in which he applied this material to close a defect, there were no seizures during the ten months following the operation. The wound healed perfectly, and there were no adhesions. Smirnoff does not consider this method practical, as the application of a massive piece of fat could not help causing cerebral pressure, and the sutures will invariably cut through the fatty tissue and allow fluid to escape.

I have been a little skeptical as to the necessity of repairing dural defects when there was no defect in the skull, nor am I convinced of its therapeutic value. The dura is a protective membrane supplemental as it were to the skull, but its presence is not essential, and its absence does not lead inevitably to critical disturbances. I have often removed a thickened and adherent dura without any attempt at repairing the defect, and have reserved the use of autoplasmic grafts, such as the fascia lata, for cases in which there were defects in the skull as well.

**Local Anesthesia.** As time goes on we find local anesthesia given a wider scope in the field of general surgery, and more recently its use has been extended to certain operations in the head and face. For the development of the latter, we owe much to the work of Braun, Offerhaus, and Härtel, of Bier's Clinic. Typical methods have been devised and adapted to the various operations on the head and face, and are recommended by these authors in all such operations. Their experiences show that the anesthesia is sufficient from the point of view of intensity and extent, as well as duration.

I referred last year<sup>3</sup> to Brauns' method of blocking the various branches of the trigeminus for operations for frontal sinus disease, for carcinoma of the nose and tongue, resection of the upper jaw, removal of the floor of the mouth and tonsils, and operations on the

<sup>1</sup> Zentralbl. f. Chir., 1913, vol. xl, No. 2.

<sup>2</sup> Presse Méd., May 4, 1912.

<sup>3</sup> PROGRESSIVE MEDICINE, 1913, p. 39.



Gasserian ganglion itself, as well as for the extraction of the teeth. Härtel<sup>1</sup> reports 27 operations, including 13 resections of the upper jaw, 8 extirpations of the tongue, 3 resections of the lower jaw, 2 operations for tumors of the tonsils, and 1 for tumor of the nasal septum. Of the 5 deaths in this series, 2 were due to heart failure, and 3 to pneumonia. Hence, even local anesthesia is not a positive protection against pulmonary complications. But Härtel, like Braun, is very optimistic as to the future of local anesthesia in this field and believes it will lend a much less dangerous aspect to many otherwise serious and radical operations.

Härtel, however, has gone still farther and has blocked the Gasserian ganglion itself for anesthetic purposes in cranial operations, according to the technique previously described under the section on trigeminal neuralgia. He uses a 2 per cent. solution of novocaine-suprarenin in doses varying between  $\frac{1}{2}$  and  $1\frac{1}{2}$  c.c. The entire area supplied by the trigeminal nerve on the side where the injection is made is rendered immediately anesthetic, and usually remains thus for one and a half hours, allowing time for the most intricate operative procedures. When necessary, both ganglia may be injected, as Härtel has done in 9 of his cases, making the entire trigeminal region insensitive. He has made use of this method of anesthesia in 16 operations; (1) extirpation of the Gasserian ganglion, 6 resections of the upper jaw, 2 operation for carcinoma of the tongue, 2 operations on the orbit, 2 tumors of the nasopharyngeal space, 1 plastic operation on the face, 3 operations on the jaw. In both cases of carcinoma of the tongue, some pain was experienced when the tongue was separated from the floor of the mouth, and Härtel does not consider that blocking of the ganglion has any advantages over his previous method for this particular procedure. There was some pain during the chiseling process in the 6 resections of the upper jaw, and Härtel recommends, in these cases, a previous injection of morphine, blocking of both ganglia, and anemic injection of the field with novocaine-suprarenin. In the other cases the anesthesia was complete.

In 1912, I referred<sup>2</sup> to Braun's wheal method of obtaining perfect hemostasis in cranial procedures. This, however, renders the field not only bloodless, but anesthetic as well. In his new work on local anesthesia<sup>3</sup> he describes at length his technique of infiltration anesthesia for various cranial procedures, including extirpation of tumors of the scalp, an extensive resection of the skull with repair of dural defect, besides various operations on the cerebellum, the ear, orbit, neck, etc. He finds that patients have no pain during the operation on the brain and skull, though the chiseling is very unpleasant when the skull has to be resected and the

<sup>1</sup> Archiv f. klin. Chir., 1913, vol. c, No. 1.

<sup>2</sup> PROGRESSIVE MEDICINE, 1912, p. 27.

<sup>3</sup> Braun: Lokal Anästhesie, Dritte Auflage, Leipzig, 1913.

disagreeable sensation should be mitigated by the administration of morphine or scopolamine. He makes a row of wheals about the outer edge of the field of operation, the number depending on the extensiveness of the operation, and, with these as starting-points, he injects, in a practically horizontal plane, the subcutaneous tissue with a  $\frac{1}{2}$  to 1 per cent. solution of novocaine-suprarenin, the latter being used if the field is large and there is danger of hemorrhage. The amount varies from 10 to 75 c.c. In some parts, especially in the temporal region, the sensory innervation is situated almost exclusively in the deep-lying tissues. When this is true, the simple circular subcutaneous injection is entirely ineffective. It is necessary to introduce the needle vertically down to the bone, then from the same wheal to introduce the needle several times at various angles so that all the layers of the periosteum, fascia, and scalp will be reached. This is often done at two points at opposite ends of the incision about to be made. For brain puncture, a single injection of a few cubic centimeters of novocaine-suprarenin at the site of puncture is usually sufficient.

Andree<sup>1</sup> has recently reported an operation performed by Mertens, of Bremen, under local anesthesia for the removal of an endothelioma of the dura the size of a small fist, situated in the falx cerebri. Three-quarters of an hour before the operation the patient was given 0.01 morphine subcutaneously. The field of operation was then injected, according to Braun's technique, with a 1 per cent. solution of novocaine-suprarenin, and larger injections made in the auricotemporal and occipital nerves. The patient felt no pain during either stage of the operation, and made a good recovery.

This, it seems to me, is a very fair test as to the efficiency of local anesthesia in cranial procedures on account of the extensiveness of the operation and the manipulations of the brain substance required by the extraordinary size of the tumor. No painful sensations were experienced even when the dura was incised. We can scarcely pass final judgment on it, however, until it has been tried in a larger number of cases.

**Hemostasis in Operations on the Brain and Skull.** Many methods have already been devised to prevent hemorrhage in cranial operations, some more effective than others. The Heidenhain'sche suture, and Kredel's modification of the latter, in the form of metal plates, have been in use for some time. Dawburn's method of causing congestion of the blood in the extremities does not merit consideration, and the same is true of Sauerbruch's technique for making the brain anemic by driving the blood away from the head into the trunk and extremities. Reference was made, in 1912, to Braun's method of making certain areas of the brain not only anesthetic but bloodless as well, by the application of novocaine-suprarenin.

Based on numerous experiments on animals and on its application

<sup>1</sup> Münch. med. Woch., 1913, vol. lx, No. 10.

in three clinical cases, Ritter<sup>1</sup> advocates temporary closure of both carotid arteries. This is not an original idea, but was recommended by Crile a number of years ago, and, after a limited trial, I discarded the method, first, because I found it to be not without danger, and secondly, because I found that hemorrhage from the scalp, skull, and pial vessels, the most common sources of hemorrhage during cranial operations, could be controlled by simpler and equally effective measures altogether without risk. However, Ritter claims that perfect cranial hemostasis may be obtained in this way, and the circulation may be interrupted for a period of thirty minutes without causing any cerebral disturbances. He uses for this purpose very fine adjustable clamps manufactured by Collin, of Paris. He applied this method once in a craniotomy for fracture of the skull, once in an operation on the mastoid, and in the exploratory craniotomy for a cerebral tumor, lasting respectively twenty, thirty-five, and thirty minutes. Complete arterial hemostasis was obtained in the first and third cases; there was slight bleeding from the galea in the second, which soon stopped, however. Venous bleeding was reduced to a minimum. In the third case, in which the skull was opened, the patient developed paralysis of the left arm and leg and left side of the face, and died two months later, the autopsy revealing not a tumor, but a subcortical abscess about which the brain substance was softened. It was impossible to tell whether the infection was of primary or secondary origin. However, Ritter draws the conclusion that while the complete clamping of the carotids is to be recommended in operations in which the cranium is opened, he cautions against complete closure of the vessel, as untoward effects may result from lack of nourishment to the brain.

For the control of hemorrhage from the scalp, I have found the tourniquet recently devised by my assistant, Dr. Landon,<sup>2</sup> most satisfactory. It consists of a thin, flexible, spring-steel, encircling band, 14 mm. wide and about the thickness of the ordinary steel tape measure. It is broken fore and aft. Posteriorly there is a sliding joint controlled by a strong coiled spring which acts as a safety valve. Anteriorly is the self-locking lever ratchet by which the band is tightened to any desired pressure. On each side there is a sliding adjustable auxiliary spring which lies over the temporal fossa to control the temporal arteries. There is also a detachable and adjustable steel band which passes from the midline in front along the line of the longitudinal sinus to a similar point behind, preventing displacement of the tourniquet downward. When the tourniquet is applied, the head is covered with three or four layers of sterile dressing gauze, the band is slipped over the head until it rests on a line passing just above the ears from the glabella in front to just below theinion behind. The temporal springs are adjusted to their proper

<sup>1</sup> *Archiv f. klin. Chir.*, 1913, vol. ci, No. 4.

<sup>2</sup> *Surgery, Gynecology, and Obstetrics*, 1914, vol. xviii, No. 1.



positions, and the surplus taken up by the sliding joint in front. Care must be taken, as with all hemostats, that it is applied with sufficient pressure to occlude all the arteries. This apparatus, being composed entirely of metal, has the advantage over the tourniquet, consisting principally of rubber tubing, in that it is practically indestructible and much more readily kept sterile; it is also easily readjusted, tightened or loosened to any desired pressure, or it may be removed at any time during the operation without danger of contamination.

The application of a small piece of muscle to stop bleeding from cranial vessels has been in use for several years, having been advocated by Horsley, Borchard, myself, and others. Mintz<sup>1</sup> has recently reported an operation for a cerebellar tumor in which he applied this measure. He took a piece from one of the cervical muscles, measuring  $2\frac{1}{2}$  cm. by 1 cm. and  $2\frac{1}{2}$  mm. in thickness, and applied it to the bleeding point. It adhered perfectly, and the operation was completed without further complications. The patient died in twenty-four hours, and the autopsy revealed a cerebellar cyst. The muscular flap had not been dislodged. Mintz has tried this method with success on three dogs; in each case there was no difficulty in adherence. I have used the muscle graft for a number of years and cannot too strongly endorse it as an efficient means of controlling bleeding, not only from the pial veins, which are difficult to ligate, but more particularly from the pacchionian bodies, hemorrhage from which could only be controlled otherwise by a tampon. A mere sliver of muscle answers the purpose and, if held in contact with the bleeding-point for a fraction of a minute, will at once seal the bleeding vessel.

**The Value of Roentgenology in Diagnosis and Operative Treatment of Cranial Lesions.** Though the scope of roentgenology in cranial lesions is necessarily limited, it has done much to place both diagnosis and treatment on a more scientific basis. Hence both surgeon and neurologist must ever bear in mind its possibilities and its limitations. As Earl<sup>2</sup> has so well brought out in his recent article, changes confined to the soft part of the brain and its membranes, such as soft tumors, abscess, hematoma, or meningitis, will seldom bring about a sufficient change in density to be reproduced by the *x*-ray plate. General thickening of the cranium is observed in cases of acromegaly, osteitis deformans, syphilis, and rickets. Localized destructions are most common near the base of the skull, and are due to metastatic lesions from the thyroid and other organs or to endothelioma. In the latter case, the skull is usually thinned while metastatic tumors cause irregular defects. The perforations caused by syphilis are frequently kidney-shaped. When there are numerous digital impressions in the skull and widening of the channels for the diploic veins, the etiological factor is usually

<sup>1</sup> Zentralbl. f. Chir., 1913, vol. xl, No. 18.

<sup>2</sup> Journal Lancet, 1913, vol. xxxiii, p. 307.

to be sought in general intracranial pressure. Dr. Artur Schüller, of Vienna, has probably done more than anyone else to increase the value of roentgenology in this region, and his recent book,<sup>1</sup> in which the abnormalities and malformations accompanying the various cranial lesions are treated quite fully, is a valuable contribution to science.

I will not dwell at length on the changes in the conformation of the sella turcica accompanying hypophysial lesions as portrayed by the roentgenogram. The value of the  $x$ -ray in the diagnosis of pituitary disease is now pretty well established. As the gland itself can be seen on the plate only in very rare instances of calcification, our conclusions must be based entirely on changes to the outline of the sella. The various forms which these alterations take—enlargement, thinning of the floor, and absorption of the dorsum and of the posterior clinoid processes—have been previously reviewed. Luger,<sup>2</sup> in his recent paper, brings out the fact that “the order of appearance of these changes in the sella turcica is quite different in the case of a tumor of the pituitary gland itself and tumor of the hypophysial stalk, or other pathological condition of the immediate neighborhood. In intrasellar tumors, we find first an enlargement in the site of the sella, with increasing thinning of its floor and of the dorsum sellæ, followed later by more or less pronounced absorption of the posterior clinoid processes and of the dorsum sellæ. This thinning of the floor and of the dorsum may finally cause a disappearance of the normal border, so that after a time we may find on the roentgenogram only very faint lines—the remains of the dorsum sellæ. Quite different is the sequence of change in the other types of tumor mentioned. Here the absorption of the clinoid processes and of the dorsum sellæ is first noticed, and, although later we find an enlargement of the sella, nevertheless this enlargement is rarely so pronounced as in the case of an intrasellar tumor; and the sella is always of the characteristic flat type, as compared with the deep and round sella of an intrasellar tumor.”

We must always bear in mind, however, the many limitations of the  $x$ -ray in this particular field. The many anomalies and variations in the normal sella very often make it difficult to differentiate between a normal sella and one indicative of a pituitary lesion. On the other hand, a lesion of the hypophysis will occasionally in the early stages have caused no demonstrable change in the sella. Moreover, besides the so-called extrasellar tumors, lesions of other parts of the brain which have no topographical relation to the hypophysis, and conditions such as internal hydrocephalus and meningitis often cause a general widening and flattening of the sella.

I have recently had 2 cases of extraordinary enlargement of the sella turcica with symptoms of dyspituitarism where I found extra-sellar

<sup>1</sup> Artur Schüller: *Diagnostik der Erkrankungen des Kopfes*, Vienna, 1912.

<sup>2</sup> *Journal of the American Medical Association*, 1913, vol. lxi, No. 10.

tumors larger than a plum with no symptoms that could not be explained by involvement of the pituitary body. Still more rarely, syphilis and tuberculosis in the base of the brain may bring about a wearing away of the walls of the sella.

Johnson<sup>1</sup> has recently been investigating a new phase of the subject—the relation of the pituitary body to epilepsy as evidenced by the roentgenogram. He has examined the sella in many cases of epilepsy and has found that there are rarely changes in the case of chronic epileptics, but in those patients who had an uneventful history and no injury and who developed epilepsy between the ages of fifteen and thirty-five, changes in the sella are observed with extraordinary regularity. The alterations take the form of overgrowth of the anterior and posterior clinoidal processes, the fossa being completely roofed over in some instances. This condition has been found so frequently that Johnson feels certain that there must be an etiological relationship.

**Pneumatocele of the Parotid Gland and Stenson's Duct (Glass-blower's Tumor).** This condition is so unusual that the operation described by Narath<sup>2</sup> is of particular interest. He believes his case to be the only one cured by operation. The patient was a glass-blower who showed a swelling of the right cheek for about nine years. Upon blowing out his cheeks, as in his work, a tumor suddenly appeared below the zygoma and opposite the lobule of the ear, remaining when the patient stopped blowing. It could be reduced, however, the air and fluid entering the mouth. The following operation was then performed: "The peripheral half of the duct was exposed by an incision parallel to the duct, and was found to be represented by a loose sac which was easily isolated. It was ligated close to its orifice in the mouth, and divided internal to the ligature, so that the latter remained attached to the portion of the duct continuous with the gland. From the wound, a probe was passed obliquely through the cheek muscles until its end made the mucous membrane of the mouth prominent. An incision was then made over the end of the probe, which was passed into the mouth. The ligature attached to the free end of the duct was tied to the outside end of the probe, and the duct thus drawn into the mouth through the passage-way made by the probe. To make a better valvular closure, the duct was twisted slightly on its axis and sutured to the margins of the opening in the mucosa, so that its end projected into the mouth 2 to 3 mm. Healing was good, and the gland condition was soon much better. But a second operation became necessary for a threatening stricture at the orifice of the duct, and was performed two months after the first. An incision was made over the duct to the parotid tissue, and the duct isolated. The gland, with the duct, formed only

<sup>1</sup> Roentgen Ray Society, 1913, abstract in the Journal of the American Medical Association, 1913, vol. lxi, No. 18.

<sup>2</sup> Deutsch. Zeit. f. Chir., 1912, vol. cxix, p. 201.



a sac which was drained externally by a rubber tube through a passage made with a slender forceps behind the lower jaw. In the following weeks an effort was made to destroy the remaining parotid tissue, from which only a small quantity of secretion was exuding. One injection of alcohol and three of chloride of zinc accomplished this purpose. The fistula closed two months later, and the patient returned to work as a glass-blower seven months after the second operation."

**Cancer.** Nothing strikingly new has been brought forward during the year for the recognition or treatment of *cancer of the oral cavity* and of its openings. Last year I emphasized the need for early diagnosis, and showed from certain statistics that our results, generally speaking, were poor. I can only again emphasize that if we are to hope for improvement in the treatment of cancer, especially of the oral cavity, it is necessary that early diagnosis be followed by prompt operation. The recent wave of enthusiasm for radium which has swept the country is apt to cause us to loose sight of the main point of issue, viz., that the only possible way at the present time that we can get ideal results is by operation.

Abbe,<sup>1</sup> whose name has been prominently identified with the radium treatment, states that he has reached the conclusion that thorough surgery is still the supreme reliance in the eradication of malignant disease of the mouth. I am also of the opinion that we had better be more radical, more sweeping in our dissections, if we are to hope for improvement in our statistics. Year after year I have presented figures differing but little, showing only a small percentage of cures. I will only discuss a few points of interest this year, and will present a few papers in detail regarding technique.

**CANCER OF THE LIP.** The operative procedures employed in the Mayo Clinic in operating on cancer of the lower lip are described by Beckman.<sup>2</sup> The principle underlying the cure of cancer of the lower lip is the same as that involving the cure of cancer in other parts of the body, that is, the primary growth, along with the glands into which the area of the growth drains, must be thoroughly removed. There is one difference which they have observed in this connection. A cancer of the lower lip is either a local growth or else a metastasis in the adjacent glands. They have never observed a cancer occurring in the lymph vessels between the original growth and the neck; consequently, it does not seem necessary to remove the lymph vessels along with the glands and the primary growth. This is fortunate, both for the patient and the surgeon, because it lessens the danger of infection from the mouth into the deep tissues of the neck. The original growth, however, should be removed with a wide margin, the wider the better.

<sup>1</sup> Medical Record, 1913, vol. lxxx, p. 461.

<sup>2</sup> Journal of the Oklahoma State Medical Association, 1913, vol. v, p. 185.

In cases in which only the submaxillary and submental regions have been entered, they do not believe that infection from the mouth is of serious consequence, since they have very often had to enter the mouth at the same time and also because infection often takes place through the cut duct of the submaxillary salivary gland. If it be necessary to extend the dissection down along the jugular to the clavicle, they prefer to perform the operation in two stages, doing the neck part first, which blocks the spread of the disease, and operating on the primary growth one week later.

The operative procedure is as follows: An incision is made three-fourths of an inch below the ramus of the jaw from one sternomastoid muscle to the other. This incision extends through the skin and platysma muscle. The reason for making the incision as low as this is to avoid the small branch of the facial nerve which swings down below the angle of the jaw and then returns on the face to supply the muscles about the angle of the mouth. Where it is necessary to remove only a small portion of the middle of the lip, Bechman says a better cosmetic result is obtained by saving these branches of the facial nerves. If, however, it is necessary to remove more of the lower lip and widen the mouth by extending into the cheek, it is not necessary to save these nerves. Through this incision, the skin and platysma muscle are reflected down to the hyoid bone and up to the inferior maxilla. All of the fascia and fat, including the submaxillary salivary glands, are removed from the submental and submaxillary triangles. It is necessary to ligate both the facial artery and vein. The blood supply to the face is so abundant through the other branches of the external carotid that no sloughing from this cause has been seen. The hypoglossal nerve and the lingual branch of the trifacial are exposed on each side and should be saved. After the removal of the glands, this primary incision is closed, drainage being established through small separate incisions on each side. The platysma muscle is stitched first, and then the skin with a subcutaneous suture. The wound in the neck is then carefully protected, and the operation on the lip begun.

A quadrilateral section, including the full thickness of the entire lip, is removed, running down nearly to the point of the chin. The section removed should include the growth and from one-quarter to one-half inch on each side into the healthy tissues. The coronary artery should be tied at each side. An incision is then made from the lower angle of the quadrilateral parallel to the ramus of the jaw on either side so far as is necessary to obtain enough tissue to close the defect. The entire flap, from which the new lower lip is to be made, should be freed well from the bone. These flaps are then sutured together in the mid-line with silkworm-gut sutures, the skin being approximated with horse-hair. If the skin remaining over the point of the chin is too long to be approximated to the new lip so that it produces wrinkles,

it is shortened by taking out a small triangle at one or both ends of the incision, as shown by the accompanying diagram (Fig. 8).

This is the technique employed in cases in which only a small portion of the lip is removed. If one-half or more of the lower lip must be removed, the primary incision is made in precisely the same way. In addition to the incision running from the lower end of the quadrilateral piece along the ramus of the jaw, it is now necessary to make incisions parallel to the former, extending from the corners of the mouth directly

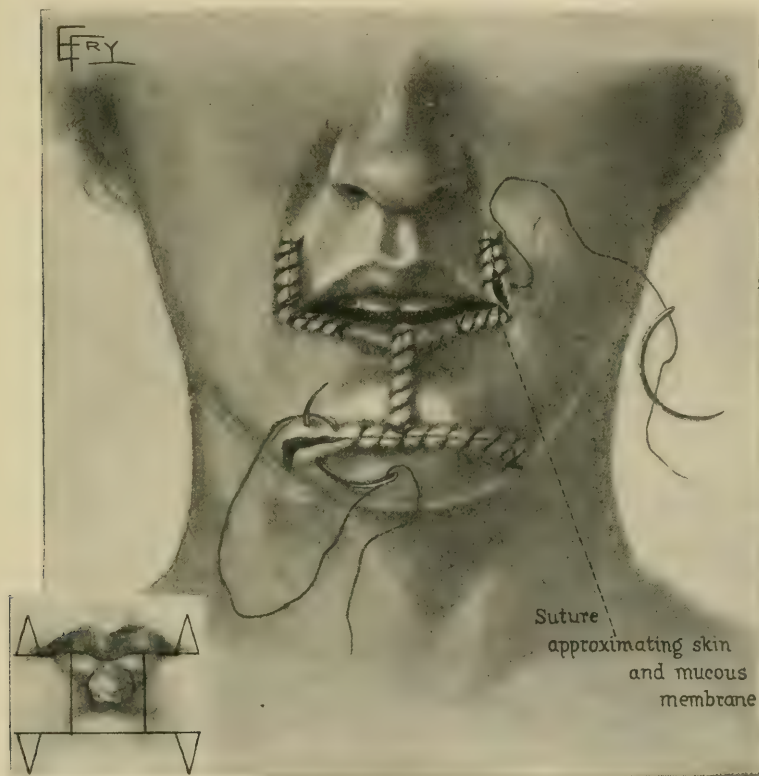


FIG. 8.—Illustrating plastic operation for removal of a portion of the entire lower lip for carcinoma.

into the cheek. These incisions should extend slightly downward rather than upward. When the flaps on each side are thoroughly free, they are approximated, as in the former case, the only difference being that the raw surface of the lower lip must be covered with mucous membrane, as just mentioned. It is now seen that the lower lip is shorter than the upper, and also shorter than the skin remaining on the chin. These two latter are shortened by removing triangular pieces from the extremity of each incision, as shown in the diagram.



From January 1, 1907, to December 31, 1911, there were 199 patients with cancer of the lower lip observed in the Mayo Clinic. Twenty-five of these may be deducted for various reasons: Two of them had had the local growth removed from the lip before coming to the clinic; 17 were considered inoperable; 2 refused operation, and 4 were not accounted for. The remaining 174 cases were proved to be cancer by both clinical and pathological diagnosis. One hundred and twenty-six patients had a radical operation performed, *i. e.*, the local growth was excised and, in addition, the lymph nodes in the neck were removed either at the time of operation on the lip or a few days later. Ninety-nine of these patients have been traced, of which 83 have no sign of recurrence, neither locally nor in the nodes of the neck; 16 have either died of their original trouble or have suffered a recurrence; 7 of these 16 patients had nodes involved at the time of their operation, and 3 others had an extensive growth on the lip. As to the time limit of the 83 cured cases, it is interesting to note that 39 have passed the three-year limit; 17 between two and three years; and 2 were operated on just one year ago. In 18 of the 126 cases operated on, glandular involvement was demonstrated by the microscopic examination at the time of operation, and 9 of these (50 per cent.) are among the cured cases.

Twenty-five patients had a late radical operation, *i. e.*, removal of the nodes in the neck following one or 2 local operations on the lip, or following treatment by paste. Twenty of these patients have been traced, of which 14 are cured and 6 not cured. Twelve of the 25 had glandular involvement at the time of operation, of which 4 were cured. Five patients had an incomplete removal of the nodes, either at the primary or secondary operation. All of these patients have been traced. In this group are cases in which an operation was attempted, but abandoned because the involvement was found to be so extensive. It also includes those cases in which glands were removed from but one side of the neck, the growth in the lip being confined entirely to one side. Two of these patients are well, with no signs of recurrence.

Eighteen patients had an excision of the local growth without the removal of any nodes. Most of these patients were seen early in the disease, but their general condition or age prevented a radical operation. Fifteen of these cases have been traced, 11 of which are cured, giving a percentage of 73.3 cures. It has been stated by other observers or borne out by statistics that an early operation for cancer, although not a radical one, is often more favorable than a late radical operation. This holds true in the present series, as 73.3 per cent. of the patients having an early local excision were cured, as compared with 70 per cent. of cured among those who had a radical operation in a late stage of the disease. There were no operative deaths in this series of cases. The following is a summary:

Group	No. cases	Operative	Traced	Not traced	Cured	Not cured	Inoperative	Per cent. cured
1. Clinical diagnosis only	25	2	6	19	2	23	17	
2. Primary radical operation	126	126	99	27	83	16	..	83.8
Glands involved	18	18	18	..	9	9	..	50.0
3. Late radical operation	25	25	20	5	14	6	..	70.0
Glands involved	12	12	12	0	4	8	..	33 $\frac{1}{3}$
4. Glands removed one side or incomplete	5	5	5	0	2	3	..	40.0
5. Local incision only	18	18	15	3	11	6	..	73.3

Ryfkogel<sup>1</sup> discussed the technique of operation for cancer of the lower lip and gives illustrations of his technique. He prefers local anesthesia after the manner of Eleessor. Roughly, he removes a square piece, including the lip and one-half of the chin; two incisions are then prolonged on to the cheek, one from the angle of the mouth and the other from the base line of the square incision. The flap should contain the facial artery, and, by curving, the lower incision should be made somewhat broader at the base than at the tip. The upper incision is bevelled to allow suture of the mucous membrane of the mouth to form the new lip. The flap is detached from the jaw, and when the head is bent forward will slide into place without tension. Hemostasis is carefully attended to and all sutures drained. The lower part of both incisions is left open, and the drainage taken care of by rubber tissue. If Steno's duct has been cut, it is reinserted through a puncture hole in the mucous membrane and held by a single catgut stitch. Two weeks later a block dissection of the neck is carried out.

CANCER OF THE TONGUE. Several years ago I quoted from Rowntree<sup>2</sup> certain facts relative to the relation of syphilis to cancer of the tongue. This relation is, of course, well known, and it has recently been emphasized by Ryall,<sup>3</sup> who states that he would not hesitate to advise excision of the tongue in a case of very extensive syphilitic lesion which remains uninfluenced by antisyphilitic remedies. Cancer of the tongue in young individuals is the subject of an interesting report by Gorse and Dupuich,<sup>4</sup> who report a case of typical cancer in a man, aged twenty-two years, with recurrence and death five months after operation. In a search of the literature, they found 23 cases of tongue cancer in individuals between twenty and thirty years of age, and 7 cases in those under twenty years of age. Curiously, there were only eight males in the group, a figure entirely at variance with the total number of cancers. The malignancy was very great, practically every case succumbing.

Skillem<sup>5</sup> suggests the use of alcohol infiltration of the lingual nerve

<sup>1</sup> Journal of the American Medical Association, 1913, vol. lx, p. 50.

<sup>2</sup> PROGRESSIVE MEDICINE, 1908, March, 66.

<sup>3</sup> British Medical Journal, 1913, vol. i, p. 913.

<sup>4</sup> Rev. de Chir., 1913, vol. xxxii., p. 293.

<sup>5</sup> Surgical, Gynecology, and Obstetrics, 1913, vol. xvi, p. 114.

for the relief of pain in inoperable cancer of the tongue. I do not quite see the advantage of this method of treatment over simple section of the lingual nerve, unless the division of the nerve fails to relieve the patient, in such cases in which the growth is situated far back in the tongue and involving the floor of the mouth. In these cases I would prefer to infiltrate directly the common trunk at its exit from the foramen ovale. Skillern, however, advises injection of 1 c.c. of a solution of 2 per cent. of novocain and adrenalin 1000 to 3000 in 4 c.c. of 70 per cent. alcohol. He injects the nerve just internal to the pterygomandibular ligament, below and behind the last molar tooth, under the mucous membrane and close to the skin.

**CANCER IN THE NECK.** The management of metastatic growth in the neck is always a vexatious one, and I am afraid we are often tempted to do too little, rather than too much. It does not matter whether the growth is early or advanced, the entire lymph-bearing area in the neck should be excised on both sides; in no other way is it possible to improve our results in the operative treatment of this deplorable disease. Partial operations for cancer are a reproach to surgery, and the patient should either have a simple removal of the primary site or else have a most radical operation done. An interesting illustrated description of the technique is given by Morestin.<sup>1</sup> I will divide his discussion into sections.

*Without Palpable Involvement of the Cervical Nodes.* He makes three incisions radiating from a common centre at the superior border of the thyroid cartilage; one is carried forward to the symphysis of the chin, the second to the anterior border of the mastoid process, and the third downward and backward to the clavicle at the posterior border of the sternomastoid muscles. These flaps are dissected up for some distance, the external jugular vein being ligated during the dissection. Beginning above the entire inferior border of the jaw bone is laid bare, ligating the facial vessels as they are encountered, and the entire mass, including the submaxillary salivary glands, turned downward. The upper triangles of the neck are carefully cleared by dissecting the mass downward off of the muscles; it is necessary to raise the parotid gland from the anterior border of the sternomastoid muscle as far as the mastoid muscle before the bloc can be completed in this direction. The superficial cervical fascia is incised along the posterior border of the sternomastoid muscles and dissected from behind forward to the anterior border of this muscle; the muscle is then dragged outward, and the inner border carefully dissected in its entire length. At the crossing of the spinal accessory nerve, it is important to dissect the mass of glands and fat *en bloc*. It is then possible to dissect the mass from above downward, carefully cleaning the jugular vein during the dissection. It is well, before completing the dissection along the vessels,

<sup>1</sup> Journal de Chir., 1913, vol. x, p. 657.



to have emptied the supraclavicular triangle by dissecting the entire pocket of fat and glands from below upward. During this dissection close attention must be given to the jugular vein, the brachio-plexus, the phrenic nerve, the transverse cervical artery, and a few large veins.

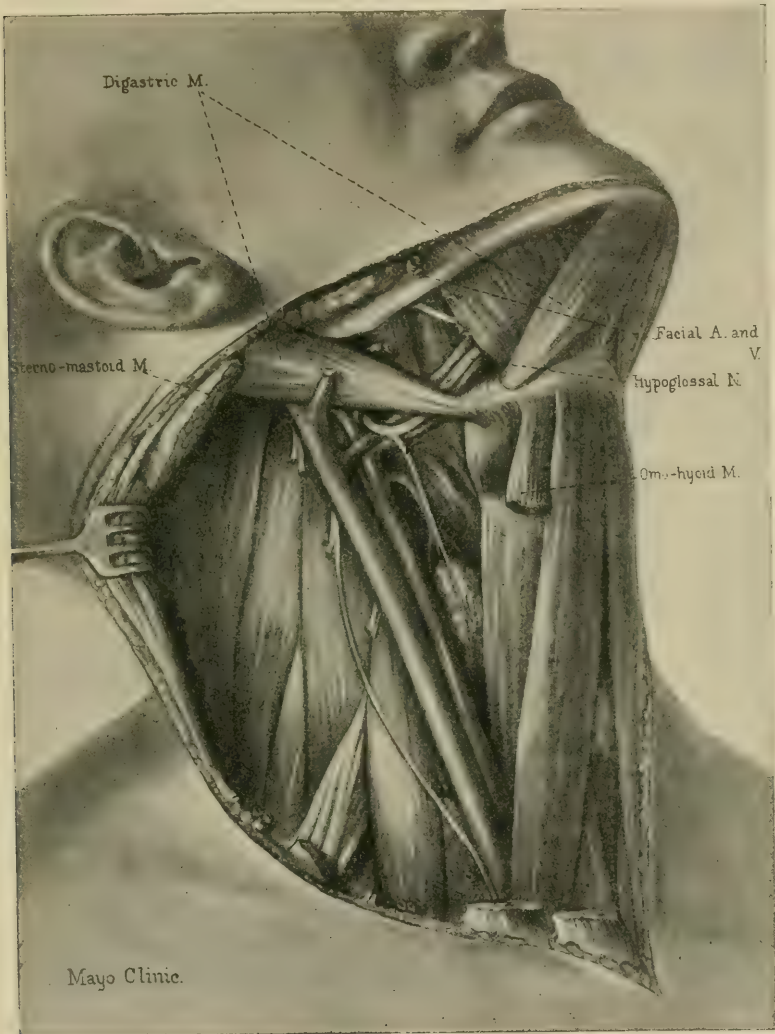


FIG. 9.—Block dissection with removal of sternomastoid muscle, employed when submaxillary glands are carcinomatous.

If the sternomastoid muscle is adherent to the fixed and enlarged glandular mass, both the muscle and the jugular vein must be sacrificed. While the order of attack may be varied, Morestin emphasizes that it should always converge upon the region most involved, which is left to the last. If the submaxillary glands are adherent, the lower portion

of the operation should be completed first, and the dissection ended by ablation *en bloc* of the submaxillary region with a part of the mandible.

**CANCER OF THE LIP.** Morestin prefers a one-stage operation, dissecting the neck first only as far as the anterior carotid group, closing the incision and then attacking the growth on the lip.

**CANCER OF THE CHEEK.** He operates in two stages: the first operation consists of the excision of the tumor, the resection of the mandible between the tumor and the submaxillary gland, and the removal of the submaxillary lymph glands on both sides. The second operation consists of a dissection of the entire neck on the affected side.



FIG. 10.—Showing incision and method of drainage employed by Morestin.

**CANCER OF THE FLOOR OF THE MOUTH.** He operates in three stages: (1) A total excision of the glands on one side; (2) a total excision of the glands on the other side; and (3) the removal of the floor of the mouth with resection of the mandible at the level of the second molar teeth. One or two weeks should elapse between each step.

**CANCER OF THE TONGUE.** The operation should be performed in one stage because the distortion of the tissues renders a second operation

difficult. If only the side of the tongue is involved, the affected side of the neck should be completely dissected out, and the other side dissected above the omohyoid muscle. After both sides have been dissected upward, the anterior border of the sternomastoid muscle is sutured to the digastric and hyoglossus muscles and to the pharyngeal wall to protect the carotid region from infection. The tongue is divided in the midline, from tip to base, and the defect closed as well as possible. The upper wound is packed tightly with iodoform gauze, a rubber tube placed inferiorly in the line of incision and another through a stab in the posterior flap (Fig. 10).

**CANCER OF THE PHARYNX AND TONSIL.** The primary tumor should be removed from within the mouth, splitting the cheek if necessary, and the dissection of the glands carried out at the same or at a subsequent sitting. Morestin notes that the sternomastoid muscle may be completely excised without notable deformity; the internal jugular vein on one side may be removed; the external carotid may be ligated without fear; section of one vagus nerve is never fatal and rarely gives rise to symptoms. Section of the spinal accessory or hypoglossal nerves is harmless, although loss of function results; the thoracic duct may be wounded without serious consequences; the common carotid and its internal branch, however, should be carefully preserved, owing to the fear of hemiplegia. It is interesting here to note a report by Guibal,<sup>1</sup> who reports a case in which the left internal jugular and the pneumogastric were resected, with death occurring forty-eight hours after operation from double pneumonia, coma, and hemiplegia, and he calls attention to similar cases in the literature in which cerebral symptoms were caused by a unilateral resection of the jugular vein. In my clinic, Dr. Müller has removed the jugular vein three times while operating for tuberculous lymphadenitis without any consequence whatever.

*Postoperative Complications.* Morestin states that bronchopneumonia is frequent. Infection of the wound is usually avoided by good drainage, but if, in spite of this, it is seen to spread, the wound should be widely opened and treated with tincture of iodine. Arterial ulceration is almost always fatal, and is first suggested by an insignificant hemorrhage which may stop spontaneously, but it is inevitably followed by a fatal hemorrhage unless the vessel is effectively sutured. Ulceration of the internal jugular vein should be treated by a tampon of iodoform gauze which may be gradually removed several days later. Edema of the glottis sometimes occurs a few hours after operation and should be treated by tracheotomy.

Morestin believes that the mortality from bronchopneumonia and from sepsis can be materially diminished by the suture, before mentioned, of the anterior border of the sternomastoid and the subhyoid, digastric and pharyngeal muscles in those cases in which the

<sup>1</sup> Rev. de. Chir., 1913, vol. xlviii, p. 96.



mouth cavity has been entered. A several stage operation is also of value. Recurrence is due to an incomplete operation, the result of technical difficulties or an insufficient incision.

**CANCER OF THE LARYNX.** There is considerable pessimism regarding the possibility of curing a patient afflicted with laryngeal cancer, and many surgeons refuse to operate upon the extrinsic form. The intrinsic variety starts with the larynx itself and does not invade the hyaline cartilages nor give any metastases until very late. Gluck<sup>1</sup> reports his results in 160 cases of removal of the entire larynx with no mortality in the last series of 63 cases. In 132 operated on before 1911, 24 patients were free from recurrence in from four to fifteen years and 21 others in three years. He gives some other interesting statistics about his operations, but I do not intend to discuss statistics this year in any detail. He makes the interesting observation that when the entire larynx has to be removed he provides the patient with an artificial contrivance which enables him to speak. A small wooden box fastened to the belt contains four bellows and an air reservoir. This is connected by a rubber tube to the patient's nose and thence down behind the uvula. The patient works the bellows by turning a crank, makes the motions of talking, and the air in the tubes in the throat supplies the voice which is distinct and without effort.

Crile<sup>2</sup> discusses the causes of complications in the technique and gives an excellent demonstration of the methods of avoiding such complications. Among the special difficulties and dangers to be overcome may be mentioned pneumonia, local infection, mediastinal abscess, vagitis, reflex inhibition of the heart and respiration. The anesthesia and the methods of using the tracheal canula are also matters of moment. As pneumonia is due, in most instances, to the inhalation of blood or to the inhalation of infected wound discharges, it can practically always be prevented by scrupulously maintaining a dry field during the entire course of the dissection, and by obtaining a clean wound without undue discharge. Every vessel that is divided should be picked up, and, when the mucous membrane of the trachea or pharynx is cut, the patient may be placed in a head-down position so that the blood will gravitate away from the lung. Crile believes that local infection may be minimized in advance by canvassing all of the contiguous territories, and by making sure that there are not present any active foci of infection, such as decayed teeth, discharging sinuses, pharyngitis, purulent rhinitis, etc. At the time of operation itself, we may control the local severity of the infection by using only sharp dissectors, by minimizing trauma, by leaving no oozing of blood, by properly closing the wound, and by using iodoform packing if there must be any open wound left. When infection has been inaugurated, he recommends the use of the hot pack, and the inhalation of medicated or plain steam.

<sup>1</sup> Berlin. klin. Woch., 1913, vol. 1, p. 953.

<sup>2</sup> Annals of Surgery, 1913, vol. lviii, p. 164.

Mediastinitis and mediastinal abscess are very fatal after-results, and usually occur one week or ten days after operation. A steeple-chase temperature is the only characteristic symptom. The complication can be avoided by preliminary operation producing a barrier of graunlation across the base of the neck and the entrance to the thoracic cage. A low tracheotomy is performed, and the deep planes at the base of the neck opened and packed. The dissection on one side of the larynx should be carried all the way to the upper margin of the field of final operation, the wound being packed with iodoform gauze, just as the deep planes of the neck are packed. In this way one vagus would bear the brunt of exposure and adjustment before the final operation is attempted, at which time the patient will be spared the vagitis consequent upon the injury to both vagi by an infected field. Crile protects against reflex inhibition through mechanical stimulation of the superior laryngeal nerves, by the hypodermic administration of atropin before operation, and by the local application of novocain to the mucous membrane of the larynx.

After trying many kinds of cannula, Crile found that the common male or female curved cannula, or even plain rubber tubing will answer the purpose. The greatest care should be exercised in adjusting the metal tubes so as to prevent a decubitus on the posterior wall of the trachea. While rubber tubing may be preferred by some patients, or a rubber tube drawn over a metal tube found the easiest to wear, yet he finds the metal tubes usually are the best and safest. In time a laryngectomy case gets along without tubes, and many patients prefer to get along without phonating apparatuses.

The anesthesia used in this operation is of the greatest importance; it should be safe, and provision should be made for the avoidance of inhalation of blood. Crile prefers nitrous oxide administered through rubber tubing carefully slipped into the preliminary tracheotomy wound. The rubber tubing should be slightly larger than the trachea, the latter being dilated and the rubber tube compressed thereby, so that a fluid-tight fit results, preventing the entrance of any blood into the respiratory tract. The piece of rubber tubing may be attached to the oxygen apparatus and a funnel, with gauze for ether, etc.

*Operative Technique.* First the skin is thoroughly infiltrated with novocain along the median line from a point above the hyoid bone to the tracheotomy opening. The tissues are divided down to the box of the larynx, the divisions of the platysma and of the other soft parts being preceded also by novocain infiltration. The dissection is then carried down along the lateral aspects of the larynx until the larynx is completely freed. If there is lack of free working space at the upper end, a lateral incision is made parallel with the hyoid. The thyrohyoid muscles above and the sternohyoid muscles below are severed. So far as its muscular attachments are concerned, the larynx is now completely mobilized. If the laryngoscopic examination has accurately

fixed the limits of the neoplasm, the level of the division of the larynx may be predetermined, and the next step will be the division of the trachea or the cricoid at a level free from disease. Before this last division is made, however, novocain is infiltrated into the mucosa throughout the entire length of the proposed division. By this means the terminals of the superior laryngeal nerves are completely blocked, and the mucosa may be divided and the larynx opened without causing a change in the respiration or the circulation. If the patient is old and the cartilage is ossified, it is necessary to exert the greatest precaution in dividing the larynx in order that the esophagus may not be injured. The divided end of the larynx is next raised up and the attachment between the larynx and the esophagus is divided with knife or scissors. In a short, thick neck, the wings of the larynx, which extend down laterally to protect each side of the esophagus, are divided with scissors. The dissection is then carried upward until the upper end of the larynx is reached, where its posterior wall becomes fused with the anterior wall of the pharynx. The upper end of the larynx is then cut free, the larger arteries being severed at the very last. Hemostasis must be most thoroughly observed through the operation. If the cancer is intrinsic, the lymphatic glands which drained the diseased zone should be carefully removed with the larynx itself.

The stump of the trachea is best left where it lies, excepting at its upper end, which may be bent forward and sewed to flaps of skin brought down from either side. If the wound is properly cared for, but little difficulty will be encountered with wound secretion entering the trachea. The trachea could be freed and stitched securely to the skin, but the loss of blood supply may result in gangrene of the trachea. The opening in the pharynx should be carefully sutured, and the line of suture reinforced by drawing other soft parts together over it. The remainder of the wound should be left wide open and packed lightly with iodoform gauze. The patient should be sustained by the fullest diet he can be made to take, and by carefully nursing.

In 27 laryngeotomies, Crile had two deaths, and he believes that these deaths were due to faults in the technique. In both cases the prognosis seemed so favorable that preliminary preparations were discarded. In one case, no protective operation was done, and the patient died in five weeks with mediastinal abscess. In the other case, no preliminary tracheotomy was done, and at the time of operation the isolated upper end of the trachea was anchored to the skin, but the isolated portion necrosed and the inhalation of pus produced a septic tracheitis and bronchitis.

In 16 of the 27 laryngeotomies for cancer, the laryngeal box was so choked with the growth that tracheotomy was required to prevent suffocation. Unfortunately, Crile does not give his remote results; perhaps it is too soon, but the success or failure of his operation will depend upon the condition of these patients five or six years after opera-



tion. The operative mortality in this series of cases was a trifle over 7 per cent.

The permanent disability of the patient, impairment of speech, disfigurement, and a predisposition to pulmonary diseases are greatly feared; the disfigurement may be covered by cravats, and Crile states that to his knowledge there is no tendency to pulmonary accident or disease. As to speech impairment, all patients acquire a buccal whisper which serves the purpose of speech remarkably well. The use of gestures and other forms of primitive language are additional aids. In a case reported by Downes,<sup>1</sup> the spread of infection was prevented by placing wide gauze packing saturated with a 1 per cent. solution of iodine into the lower angles of the wound on either side of the trachea.

**Sarcoma.** SARCOMA OF THE SUPERIOR MAXILLA. An observation worth reporting was made before a meeting of the New York Surgical Society by Gerster, Martin and Moschowitz, and others.<sup>2</sup> Gerster stated that he failed to see the benefit of preliminary ligation of the external carotid prior to operations on the superior maxilla.

**SARCOMA OF THE LIP.** Landon<sup>3</sup> has reported a case of rare sarcoma of the lip from my clinic in the University Hospital. It was a curious case, and clinically was thought to be an epithelioma. The patient was a man, aged seventy-six years, who two years before had been stung on the lip by an insect. A small lesion resembling a fever blister resulted, which never healed. Four months before he came under our notice, the ulcer began to spread; there was never any pain. Upon examination we found, on the lower lip close to the midline, a rounded mass,  $1\frac{1}{2}$  cm. in diameter, ulcerated, scabby, and indurated (Fig. 11). The submaxillary nodes on both sides were enlarged, hard, and partially fixed. The anterior cervical nodes were also palpable, but freely movable. At operation, under tracheal anesthesia, the submaxillary nodes, salivary glands, and fatty tissue were removed *en bloc*, and, at the same time, a square flap of tissue representing a considerable portion of the lip and chin was excised. Pathological examination revealed a mixed-cell sarcoma infiltrating the muscle tissue. In this case the plan of operation was somewhat modified from that which I usually employ; owing to the patient's age, the dissection was confined to the submaxillary region. One month after operation the patient noticed enlarged nodes in both sides of the neck and one month later he returned, and we attempted a second operation, but were obliged to abandon it as hopeless. Recurrence occurred in the lip, tongue, and floor of the mouth, and death occurred five months after the first operation.

In a careful review of the literature, Landon has found only 3 other cases of true primary sarcoma of the lip. After this paper was read, but before it was published, a report appeared by Markley,<sup>4</sup> in which a

<sup>1</sup> Annals of Surgery, 1913, vol. lvii, p. 948.

<sup>2</sup> Ibid., vol. lv, p. 953.

<sup>3</sup> Ibid., vol. lviii, 545.

<sup>4</sup> Journal of the American Medical Association, 1913, vol. lxi, p. 334.

case of small round-cell sarcoma was noticed, with a clinical diagnosis of epithelioma. Radical operation was followed by apparent cure one year after operation. These two papers represent all we know about this rare disease.

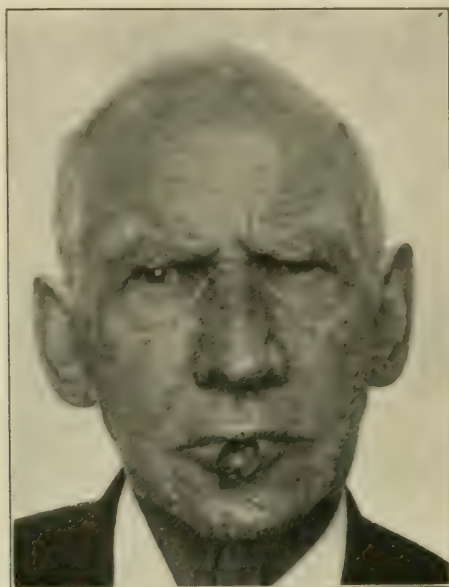


FIG. 11.—Sarcoma of the lip.

**Tuberculous Cervical Lymphadenitis.** Last year I discussed this subject at length, and presented my reasons for advocating the radical treatment by operation in preference to conservative treatment by the x-ray, tuberculin, etc. The experience of my clinic has been reported by Müller.<sup>1</sup> During twelve years we operated upon 96 cases of tuberculous lymph nodes in the neck. Following the classification of Dowd, we found that there were 2 cases in infants under two years, both of which recovered, and some time later were reported as being free from recurrence. There were 49 cases in children from two to seventeen years of age, all of whom recovered from the operation, and, of 37 traced, in 32 there was no recurrence; 2 had died, and 3 had suffered recurrence. In adults, *i. e.*, patients over seventeen years of age, there were 46, all of the patients having recovered from the operation. Of 28 traced, 18 were free from recurrence, 4 had died, and 6 suffered from a recurrence.

The following is an outline of our position in the matter of treatment: After a careful history has been obtained and an examination made, the portal of entry can usually be surmised, and, if necessary, the tonsil, adenoid, or carious tooth should be removed, or any ulcer, scab, pediculosis, otitis, etc., attended to. In those cases seen early, with only

<sup>1</sup> *Annals of Surgery*, 1913, vol. lviii, p. 433.

a small area involved and when the child is in good health, an operation should be advised. If the social position permits, this dissection should be confined to the macroscopic group, with a minimum scar, and the child sent to the seashore and kept from school for one year; the general and hygienic details of treatment being carried out with scrupulous care. In the case of the poor child, or where such cannot be carried out, we think the entire submaxillary and cervical chains above the omohyoid should be excised. The general treatment must then be carried out at home. If the case is seen late, with one or both sides choked up, the *x*-ray is often of advantage in reducing the hyperplasia, and a radical dissection can be carried out at an opportune time. If caseous abscesses, sinuses, etc., exist, they should be opened up, curetted out, and an effort made to thoroughly clean up the tuberculous granulation tissue, after which the *x*-ray is often valuable in promoting healing. We prefer the transverse incision whenever possible, especially for the submaxillary and upper part of the deep cervical. When the mass has crossed posteriorly beneath the muscle, or involved the posterior superficial cervical chain, an oblique incision from the posterior edge of the mastoid along the posterior edge of the muscle to just below its middle, and then prolonged transversely to the thyroid muscles will give a large field area. Finally, intratracheal insufflation anesthesia offers immense advantages in difficult cases, although pharyngeal insufflation anesthesia suffices for the easy ones. At all times we must keep in mind that we are "not only treating a case of tuberculous glands, but are dealing with a human being infected with tuberculosis. The difference between the two points of view is enormous, and the success will largely depend upon the one chosen by the physician" (Hawes).

Jopson<sup>1</sup> takes a similar stand, and states that his own results from operation have been satisfactory. He quotes from a previous contribution of mine to *PROGRESSIVE MEDICINE*, 1910, March, p. 64, and states that I refer my cases to the *x*-ray laboratory for treatment after operation to prevent recurrence. Jopson does not agree with this statement and protests against the indiscriminate use of the Röntgen ray owing to the dangerous influence on metabolism. In the article referred to, I stated that "when feasible, I refer all my cases to the *x*-ray laboratory after the operation, where, for a period of several months, at not too frequent intervals, a short exposure is made." This is only done in those cases of extensive tuberculous lymphadenitis in which the entire neck has been dissected out and where some spilling of caseous material has occurred. I am not in favor of the indiscriminate use of the *x*-ray on the early cases in children.

From the conservative standpoint, we have the contribution of v. Mutschenbacher,<sup>2</sup> whose experience seems to have been enormous, as he reports 1500 cases observed at the Reczeiss Clinic in Budapest. Of these, only 9 per cent. were operated upon, the remainder were treated

<sup>1</sup> *Archiv. Pediatrics*, August, 1913.

<sup>2</sup> *Berlin. klin. Woch.*, 1913, vol. xxy, p. 1.



conservatively. He seems to wait until softening from caseation has occurred, and then, by means of small incisions, evacuate the mass. Brown<sup>1</sup> objects to the "radical operation" because it is impossible, he believes, to completely remove the infected nodes. He produced a Bier hyperemia by an elastic band around the neck for a few hours before operation, and then incises the gland directly and evacuates it by a dull spoon, introduces 2 to 4 per cent. formalin and glycerin solution, and seals the incision. Primary healing occurs in 50 per cent. of the cases. Of the remaining 50 per cent., 30 per cent. have only a serous discharge, which ceases after 3 or 4 injections, and the remaining 20 per cent. suppurate more or less, depending on the delicacy and completeness of the technique. He is also an advocate of the injection of the enzymes of yeast. Pybus<sup>2</sup> also believes that the results of treatment by operation are disappointing, and gives the same reasons that are in common use by the advocates of conservative treatment. I do not wish to make further comment upon these observations, except to call attention to the papers of Dowd, and to those of Müller and Jopson. We believe that our results in early cases, both as to recurrence and as to the avoidance of injury to important structures, are sufficiently favorable to be compared with any of the other methods of treatment advised. Furthermore, if the portal of entry is properly attended to, the removal of the tuberculous mass in the neck must relieve the patient of a load of tuberculous infection under which he might otherwise stagger with serious consequences. Several years ago, I discussed the Dollinger operation, in which it will be remembered an incision is made in the hair line, and the nodes removed subcutaneously. Recently Nicoll<sup>3</sup> advocates what is called the "Treve operation," performed as follows: A small incision is made, usually in the region of, and parallel to, the clavicle. Through this incision, the enlarged glands are tunnelled out by the dissecting finger. He believes this method is more applicable to adults than the Dollinger, but I am of the opinion that it is open to the same objections; it is a blind, dangerous method of dissection.

**Hodgkin's Disease.** Many attempts have been made to cultivate an organism from the lymph nodes in Hodgkin's disease. This has especially been the case since the discovery of the *Spirochæte pallida*. Bunting and Yates<sup>4</sup> have described a diphtheroid organism obtained in pure culture from 4 cases of Hodgkin's disease and observed in three others. In the later paper, they injected a twenty-four-hour growth of culture on Loeffler's serum diluted with normal salt solution into the right axilla of a *Macacus rhesus* monkey. The animal developed an induration in the right axilla involving the lymph nodes. A second injec-

<sup>1</sup> Medical Record, 1913, vol. lxxxiii, p. 12.

<sup>2</sup> Clinical Journal, September 17, 1913, p. 369.

<sup>3</sup> Glasgow Medical Journal, 1913, lxxx, p. 81.

<sup>4</sup> Archives of Internal Medicine, 1913, vol. xii, p. 236.; Journal American Medical Association, 1913, vol. lxi, p. 1803.

tion was given about eight weeks later, and, one month after the second injection, some of the lymph nodes in the axilla were removed under ether anesthesia. They observed a chronic lymphadenitis, with atypical proliferation of the endothelial cells, a beginning proliferation of the stroma tissue, and a well-marked esinophilic infiltration, also a periglandular sclerosis. The blood picture in the animal was characteristic of the early stages of Hodgkin's disease. As a result of this investigation, they suggest the possibility of this organism—designated *Corynebacterium Hodgkini*—as being responsible for the disease.

**Hygroma of the Neck (*Hygroma Cysticum Colli*).** An instructive and timely paper by Dowd<sup>1</sup> upon the structure and etiology of these cysts has appeared. Insofar as I can remember, I have never seen one, and have been inclined to doubt their clinical identity, believing that they were probably a branchial cyst, a cystic lymphangioma, etc. Dowd, whose experience in neck surgery has been very great, never saw a case until recently, when he believes that three undoubted cases and probably a fourth came to hand. The growths are rare, less than 100 having been reported in the literature, with 35 additional cases located principally in the axilla, but in part, at least, extending there from the neck. Dowd believes that the term hygroma should be confined to those cystic tumors which have endothelial linings and serous contents, and which grow with much power through the tissues of the neck or downward under the clavicle into the axilla or pectoral region. Dowd believes that there is no doubt that these cystic growths are due to embryonic sequestrations of lymphatic tissue. The cyst wall is lined with endothelium, differing from the epithelial lining found in branchial cysts, and not corresponding to the tumors which are found in connection with ordinary lymph nodes.

These cysts are generally described as being a small bubble-like growth at birth which were almost quiescent for many months, and which then took on rapid growth. The growing power is enormous, almost as rapid as that of a very malignant tumor, but resembling the rapidity of increase in size observed in cysts in other parts of the body. I am giving abstracts of the operations performed by Dr. Dowd on his cases in the hope that they may be of assistance to some one in performing similar operations. It would save space to state that excision is the best treatment; if this is impractical, partial excision is the next best; but it is often helpful, in approaching an unusual condition, to have heard the experience of some one who has travelled the same path previously.

CASE 1. A cyst in the right side of the neck, about 4 inches in diameter, extending from the acromion to the anterior border of the sternomastoid, and from the spine of the scapula to well in front of the clavicle (Fig. 12). A transverse incision was made above the clavicle and parallel to it. The cyst was enucleated through this incision as far as

<sup>1</sup> Annals of Surgery, 1913, vol. lviii, p. 112.

the pedicle, which came just in front of insertion of sternocleidomastoid muscle at the inner edge of the sternum. When the cyst was opened, it was found that it ran under the sternum into the thoracic cavity, but extrapleurally. It was shaped like an hour-glass and the constricted portion was large enough to admit the finger, the inner dilated portion to have a content of 3 to 4 ounces; and went up as far as the thyroid, and downward under the sternum for about two inches, outward under the clavicle for an inch or more. As much of this lining membrane as could be dissected away was drawn out into the wound and cut off. No attempt was made to lay open this entire inner dilated portion, the condition of the child would not warrant so extensive a procedure. The wound was closed without drainage.



FIG. 12.—Cystic hygroma of the neck. This cyst was multilocular. One portion extended around the lower inner border of the sternomastoid muscle into the mediastinum and formed a saddle-bag-shaped cyst. Expansion could be noticed in the outer part when the child coughed. It contained clear fluid and was apparently lined with endothelium.

As a result of the incomplete operation, the swelling recurred, and a second operation was performed about one month later. A transverse incision was made from the inner end of the clavicle well back to the posterior portion of neck. The skin and superficial fascia were dissected up and the cyst found to have reformed in the position where it previously existed. The prolongation which extended down under the sternum could not be found. The cyst was 3 by 4 inches long and 2 inches wide. It presented the same characteristics as the one previously removed. It was dissected out in its anterior, lower and upper portions, and was found to have a pedicle to one of the scaleni muscles. After



careful dissection, this pedicle was divided, but it frayed out, and there was no evidence of an opening which extended farther. The cyst contained clear serous fluid; there was considerable fatty tissue on its outer side, also some lymphatic tissue. The wall was thin, and similar to one previously removed. There was no evidence of epithelium or communication with the deeper structures. The child showed considerable reaction after the second operation. There was free serous discharge, and on the seventh day there was hemorrhage from the wound, some oozing on the following day, and on the tenth day she died.

CASE 2. Just beneath the clavicle and over the upper left side of the chest was a cystic tumor, with thin walls above and thick below. It extended from the sternum to the outer edge of the pectoralis major, and from the sixth rib to the clavicle. A curved incision, with its convexity outward, was made from above the clavicle to the sixth rib and axillary line. The pectoralis major was found to be in front of the cyst. Its fibers were therefore split with the hope of extracting the cyst through this split; this, however, was not possible. It was found that a portion of the cyst projected between the upper fibers of the pectoralis major and the clavicle. Finally, the entire width of the pectoralis major was divided. The cyst was then found to press forward from beneath the clavicle. The axillary vessels and the brachial plexus were pushed forward. The cyst had extended beneath the pectoralis minor, and also in front of it, so that it enveloped it. It was multilocular, the locules having walls of different thicknesses and varying in size from a pullet's egg down. In some places the walls were very thin indeed, so that these cysts ruptured on pressure.

Portions of the growth were also found pushing upward beneath the sternomastoid muscle. The child made a reasonably good recovery from the operation and went home in one month, and sometime later developed a sore throat with laryngeal obstruction, and died.

CASE 3. A large cystic swelling on the right side of the neck extending from the clavicle, acromion and border of scapula up two-thirds of the way to the ear. A long, transverse incision was made, and the fatty subcutaneous tissue was found to be edematous. The cyst wall was not definitely limited as if this edema had not existed, but it was fairly well dissected out. It extended forward to the sternomastoid muscle above the clavicle and behind its border. It extended backward under the trapezius, and was so intimately adherent to the scaleni muscles that they were separated from it with great difficulty. Some of the branches of the cervical plexus were adherent in the wall of the growth. The posterior branch of the eleventh nerve could not be found. The wound was partly closed and drained. It healed satisfactorily, and the child left the hospital two weeks after operation.

CASE 4. A cystic tumor on the left side of the neck extending from behind the sternomastoid muscle forward almost to the median line, and from the mastoid process nearly to the clavicle. A transverse

incision was made which had to be carried across the sternomastoid muscle. This muscle was divided. The cyst was multilocular, very thin-walled, dark looking in places and extended up into the interstices of that portion of the neck. In removing it, the internal carotid and internal jugular veins had to be separated for two inches or more. The internal jugular vein was liberated from it with great difficulty, as it was densely adherent to it. The pneumogastric phrenic and spinal accessory nerves were exposed for long distances. The cyst walls were attached firmly to the deep aponeurotic structures of the neck, and the dissection extended well down to the transverse processes of the cervical vertebræ, exposing the branches of the cervical plexus as well as the nerves previously mentioned. Apparently, it was completely removed, but certain portions of the hygroma were so thin-walled and the loculæ so small that their delicate structure could not always be distinguished from the normal tissues and it is possible that some little portions remained behind. The wound was closed, and child made a good recovery.

**Tumor of the Carotid Body.** The carotid body is usually found in the human being a little posteriorly to the bifurcation of the common carotid artery and closely attached either to the internal or to the external branch. It is a vascular organ, well supplied with nerves and having a very obscure physiology. The body is related to the chromaffin system and the experimental work so far done indicates that the function, whatever it may be, is not important. It is supposed that this function is in some way connected with trophic stimuli in body development.

Pathological studies on the carotid body are limited to tumor, of which sixty (60) have been reported. I<sup>1</sup> have previously discussed the monograph of Keen and Funke, wherein 27 cases in living persons were reported, and 2 cases which had been discovered at autopsy. To these, Callison and MacKenty<sup>2</sup> add 31 additional cases; 28 cases in the living, one at autopsy, although known to exist before death, and two discovered at autopsies. From their paper I have obtained the following description of the clinical features of these tumors:

**ETIOLOGY.** Nothing more definite is known of tumors of the carotid body than is known of the causation of other neoplasms. Thirty-one cases occurred in males, and 28 in females, with the sex not stated in one case. The ages by decades are:

Up to twenty years, 3 cases; twenty-one to thirty years, 13 cases; thirty-one to forty years, 12 cases; forty-one to fifty years, 14 cases; fifty-one to sixty years, ten cases; over sixty one years, 5 cases.

In 3 cases the age is not stated.

**THE NATURE OF THE GROWTH.** These tumors usually have a long history of slow growth, resembling a benign neoplasm, and are encap-

<sup>1</sup> PROGRESSIVE MEDICINE, March, 1910.

<sup>2</sup> Annals of Surgery, 1913, vol. lviii, p. 740.

sulated, non-infiltrating, do not return if completely removed, and give rise to no symptoms other than the deformity. Later, they may take on rapid growth and assume the characteristics of a mildly malignant tumor. By reason of the varying structure of the tumor, a uniform classification into one of the recognized tumor groups is not possible. They have been usually diagnosed as endothelioma or perithelioma, and sometimes as sarcoma, "struma," carcinoma, etc.

**SYMPTOMS.** At first there are no symptoms except the deformity of the neck, but, later, with involvement of the cranial and sympathetic nerves, there may be difficulty in phonation or swallowing, an annoying cough, a deafness, or conjunctivitis. The *objective symptoms* are more numerous and more constant. A tumor of varying size will be discovered, egg-shaped, single, discrete, firm, elastic, movable laterally but not vertically. It is on the level with the upper border of the thyroid cartilage and at the edge, or just beneath, the sternomastoid muscle. There is a pulsation, transmitted, but not expansive, and in most cases a distinct bruit is present. Later, laryngeal paralysis may develop, the pupils become irregular and fail to react to light on the affected side. Still later, the tumor becomes more extensive and infiltrates the surrounding structures.

**DIFFERENTIAL DIAGNOSIS.** So many diseases resemble tumors of the carotid body, and the lesion is so rare, that the diagnosis is ordinarily not made. Seven cases only have been recognized before operation. They have been usually diagnosed as a cervical lymphadenitis, sarcoma or carcinoma of the lymph nodes, lipoma, fibroma, aneurysm, branchial cyst, gumma, aberrant thyroid, etc. If the causation of most of these diseases is looked into, if the course of most of the remainder is known or remembered, the differential diagnosis should not be difficult.

**SURGERY.** Surgical treatment depends upon the stage in which the tumor is seen. If operated upon early, the mass may be dissected away from the bifurcation. Keen advises against this, but Callison and MacKenty can see no objection if a close watch is kept for recurrence, and then such further operative procedure taken as the case may demand. On the other hand, if the tumor surrounds the vessels, is closely adherent, and its wall and other structures are included in the surface of the growth, the tumor and arteries should be removed in one mass. If a partial dissection is done, recurrence is almost certain to occur. The formal operation of removal is a difficult and dangerous operation and involves ligation of the common internal and external carotid arteries, ligation of the internal jugular vein and almost certain danger to the pneumogastric, hypoglossal, and other nerves.

Graham<sup>1</sup> has also written upon tumors of the carotid body, but he does not find nearly so many cases as do the previous writers. He states that there have been 35 operated cases reported in the literature, and adds 2 from his own experience. Of 36 cases in which the case

<sup>1</sup> Cleveland Medical Journal, 1913, vol. xii, p. 537.



reports are complete, all three carotids were ligated 22 times; the external carotid only 5 times; tumors removed without injury to the vessels, 7 times. The vagus was injured 6 times; the hypoglossal 8 times; and the sympathetic 4 times. Hemiplegia occurred 5 times, of which 4 lived and one died; cerebral hemorrhage took place only once, with recovery. There was recurrence in 4 cases, and an immediate mortality in 6. One case died nine weeks later from cerebral hemorrhage, and one case one year after operation from recurrence. At some future time I will endeavor to go over the literature on this subject and present an accurate list of the cases. Chiari<sup>1</sup> has also reported a case in which recovery occurred from operation. The branches and trunk of the external carotid were ligated, the common carotid being temporarily ligated during the dissection. Sinjuschin<sup>2</sup> has also reported 2 cases in a Russian journal.

**The Thyroid Gland.** Owing to the fact that I have taken up so much space this year with other matters, I will be brief in my discussion of goiter and its various manifestations. The interesting papers of McCarrison, published in the London *Lancet* early in 1913, are of great interest, but will no doubt be discussed later by Dr. Stengel. The most interesting contributions to exophthalmic goitre, at least those that have impressed themselves upon me as most interesting, have been those upon the kinetic theory of this disease as elaborated by Crile<sup>3</sup> and those published from the Mayo Clinic by Wilson<sup>4</sup> and by Plummer.<sup>5</sup>

THE KINETIC THEORY OF GRAVES' DISEASE. "Graves' disease is not a disease of a single organ or the result of some fleeting cause, but is a disease of the motor mechanism of man, the same mechanism that causes physical action and that expresses the emotions; its origin is in phylogeny, and its excitation is through either some stimulatory emotion intensely or repeatedly given, or some lowering of the threshold of the nerve receptors, this establishing a pathologic interaction between the brain and the thyroid." (Crile.) More briefly, Graves' disease is a disease of the motor mechanism which may be induced by overstimulation of the nervous system, which in time causes an overproduction of thyroid secretion. Thyroid secretion is an excitant to the nervous system, and thus a vicious circle is established.

Crile believes that the inauguration of the thyroid activity may be assigned clinically to (1) adverse emotional strain, such as worry, fear, or disappointment; (2) a previously existing thyroid; (3) acute infectious diseases; (4) tumors of the thyroid; (5) the excessive use of

<sup>1</sup> *Beit. z. klin. Chir.*, 1912, vol. lxxi.

<sup>2</sup> Abstracted in *Surgery, Gynecology, and Obstetrics*, August, 1913, p. 137.

<sup>3</sup> *American Journal Medical Sciences*, 1913, vol. cxlv, p. 28; *Cleveland Medical Journal*, 1913, vol. xii, p. 15; *Annals of Surgery*, 1913, vol. lvii, p. 648, etc.

<sup>4</sup> *Northwest Medicine*, 1913, vol. v, p. 1, and *Medical Record*, 1913, vol. lxxxiv, p. 373.

<sup>5</sup> *Journal of the American Medical Association*, 1913, vol. lxi, p. 650; *American Journal Medical Sciences*, 1913, vol. cxlvi, p. 781.

thyroid extract or of iodine. The threshold of the nervous system is lowered, the brain is activated, the thyroid, together with other organs of the body, is activated, the increased thyroid secretion *increases* the excitability of the brain and a reciprocal interaction is established—exophthalmic goitre has occurred.

The studies from the Mayo Clinic are based on the clinical and pathological relationship of exophthalmic goitre. They demonstrate that one group of symptoms is due to pressure on the trachea and adjacent vessels and nerves; a second group, the acute toxic symptoms, are due to a thyroid toxin which passes into the general circulation and acts directly on distant vital organs; a third group are the secondary result of (a) degenerative changes produced in distant organs after their affection by thyroid secretion, and (b) of the disturbance of the normal interrelations of these organs themselves. Exophthalmic goitre is a definite clinical complex *always associated with hyperplasia of the thyroid*. Studying the cases coming to operation between January 1, 1909, and January 1, 1913, 2917 in number, Plummer found that they could be divided into:

1. *Hyperplastic-toxic*. 42.8 per cent. of the total number showed hyperplasia of the gland, and, of these, 99.2 per cent. had toxic symptoms; the average age of onset of these patients was thirty-two years, and the average age of appearance of toxic symptoms was 32.9 years. Plummer believes that probably all toxic hyperplastic goiters may be included under the term exophthalmic goiter.

2. *Hyperplastic-atoxic*. These cases represented less than 1 per cent. of the hyperplastic group, and may represent a slight margin of error.

3. *Non-hyperplastic-toxic*. 57.2 per cent. of the total number showed no hyperplasia, and, of these, 23.3 per cent. were toxic. The non-hyperplastic goiter was noted at the average age of twenty-two years, and the evidence of intoxication at the average age of 36.5 years. Plummer calls attention to the fact that a person twenty-two years of age with an adenoma of the thyroid has a definite chance of developing a train of symptoms during the thirty-sixth year so similar to the symptom-complex associated with the hyperplastic thyroid that the best trained diagnosticians are constantly confusing the two conditions.

4. *Non-hyperplastic-atoxic*. The ordinary colloid goitre or adenoma without toxic manifestations.

Wilson<sup>1</sup> has found that in a series of 1208 so-called "exophthalmic goiters," plus 585 so-called "simple goitres," or a total of 1793 thyroids, but four instances of marked primary hypertrophy and hyperplasia of the parenchyma have been noted in cases which did not show clinical symptoms of true exophthalmic goitre; three of these four patients were children.

"It would therefore appear that the relationship of primary hypertrophy and hyperplasia of the parenchyma of the thyroid to true exoph-

<sup>1</sup> American Journal Medical Sciences, 1913, vol. cxlvi, p. 781.

thalmic goitre is as direct and as constant as is primary inflammation of the kidney to the symptoms of true Bright's disease." (Wilson.)

If hyperplasia is the underlying pathological condition, how does surgery exert its benefits? In the words of Crile, the reciprocal interaction between brain and thyroid gland is broken on the thyroid side by tying the vessels, breaking thereby the nerve, as well as the vascular supply, or by excising a suitable portion of the gland. I particularly wish to record my entire satisfaction with the anoci association method of operating in these cases; it has robbed the operation of thyroidectomy of all its terrors. I invariably practise it on my patients, perform the preliminary vessel-ligation as advised by Mayo (to try out the reaction, as it were), and then do various degrees of thyroidectomy. Finally, to again quote from Crile: "What then is the surgical view-point? It is that every case of Graves' disease should be first given rest, real psychic rest, diverting rest; and, if not relieved, an early surgical operation will relieve or cure. If the operation is timely, the result is almost certain; but, as in operations for cancer, if late, the results depend on the amount of preventable damage already done; surgery offers to forge one of the links, frequently an indispensable link, in the chain of cure. The vast accumulation of clinical facts presented by surgery, showing the benefits of operation through diminishing the thyroid secretion, is to be compared with the assertion that the hyperplastic thyroid bears no relation to exophthalmic goitre."

Mayo<sup>1</sup> announced that during the twenty-five years ending May 14, 1913, they had performed 5000 operations on the thyroid gland. In the discussion on this paper, Crile advocated the appointment of a goitre commission, a suggestion which is quite timely owing to the divergence of opinion existing in the profession at the present time. Porter<sup>2</sup> again advocates the injection of boiling water in the treatment of hyperthyroidism. He believes that it will prove of especial value in those cases wherein either the location of the gland or the severity of the symptoms precludes the operation of thyroidectomy, which, however, remains the treatment of choice in patients who are good surgical risks. The boiling water is injected, under aseptic precautions, by means of a fine needle into the right and left lobes and isthmus, beneath the capsule. About 20 cases have been treated, with quite a percentage of improvement.

**LIGATION OF THE INFERIOR THYROID ARTERY.** Halstead<sup>3</sup> states that for the past two years or more he has tied the inferior in preference to the superior arteries because of the better cosmetic result, the larger size and greater constancy of the inferior vessel, and the greater ease of the subsequent lobectomy. His method is as follows: "A transverse cut, from 4 to 4.5 cm. in length, is made over the tendon of the omohyoid muscle precisely in the line of the Kocher collar incision, as

<sup>1</sup> Journal American Medical Association, 1913, vol. lxi, p. 10.

<sup>2</sup> Ibid., p. 88.

<sup>3</sup> Annals of Surgery, 1913, vol. lvii, p. 178.



contemplated for the subsequent lobectomy. The fibers of the sternomastoid muscle are separated in line of the common carotid artery at the level of the omohyoid tendon. The thyroid lobe is exposed behind the posterior fibers of the sternothyroid muscle and drawn inward by a retractor designed for this purpose. The common carotid is retracted outward by a similar, though somewhat shorter, instrument, and the layers of fascia covering the inferior thyroid artery are divided at the level of the omohyoid tendon. The dissection is then carried out solely with the two long, delicate, blunt dissectors, for the artery is sometimes at a great depth (greatest when the Graves' disease has been engrafted on a colloid goitre), and the space is only large enough, as a rule, to admit one finger between the deeply concave retractors. A special aneurysm needle is used for carrying the fine silk ligatures around the artery. The wound is, of course, not drained. The operation, as performed precisely in this manner, is not difficult. Only once have we failed to find the artery in its usual situation; this was about five years ago."

**The Thymus Gland.** Progress in the study of the glands of internal secretion has been slow owing to the complexity of the problems involved. The thyroid gland, at least in its clinical aspects, is better understood than the others, and the increasing attention paid to the hypophysis is making that gland more accessible to clinical study. The thymus gland is mostly noteworthy because of its association with the so-called "status lymphaticus," and also because of its relation to exophthalmic goitre. The literature is gradually assuming large proportions, and a number of surgeons have recorded observations which bid fair to be of practical importance. One is tempted to say that there have been many epoch-making papers in the development of our knowledge of the diseases of the thymus, but, like many other affections in medical science, progress is slow and investigations which we think epochal are merely steps in the development of our knowledge of the disease.

An exhaustive review has appeared from the Mayo Clinic by C. H. Mayo and McGrath.<sup>1</sup> They refer to Friedleben (1858), Hart (1908), Hammar (1909), Wiessel (1912), among others as having contributed exhaustive reports. I might also mention the work of Klose and Vogt,<sup>2</sup> who found that extirpation of the thymus in dogs at the period of its maximum development, viz., at the tenth day to the twentieth day of life, is followed by a state of adiposity lasting for three months, after which the dogs became cachectic and died in a state of coma. Klose regards the thymus as an organ that inhibits the formation of acids in the body, or neutralizes or masks a successive formation of acids. Klose also notices, in another contribution, that partial extirpation of the thymus at the height of its development or total extirpation

<sup>1</sup> Collected Papers, 1912, p. 556.

<sup>2</sup> *Beit. z. klin. Chir.*, 1919, vol. lxi, No. 1.

during the periods of involution are followed by no permanent ill-results, compensation by some other organ, such as the spleen, acting for the lost thymus. The function of the thymus seems to be concerned in the process of nutrition, particularly the ossification of bone. Several investigators have described this, and, in 1909, I described MacLennon's investigations. Park<sup>1</sup> refers to the association of the pituitary and thymus with skeletal growth, and believes that the lesions of pituitary origin usually occur later in life, whereas those of thymic origin pertain to the early period, and are associated with so much that is spoken of as rickets that the influence of the thymus is something never to be disregarded. He also discusses the relation of achondroplasia, dwarfing, osteopsathyrosis, bone cysts, osteomalacia, etc., to disturbances of the thymic gland. It is interesting, in this connection, to recall the classification of rickets advanced by Bland-Sutton:

1. In childhood it affects the bones, especially the skull, thorax, and extremities.

2. At puberty, the axial skeleton.

3. In adults occurs fragility of bone which show large marrow cavities containing a very soft marrow. But, as Park states, no one ductless gland is solely at fault, and the entire subject needs much further elucidation.

The thymus gland lies just behind the sternum, in the anterior mediastinal space, and in front of the upper part of the pericardium, the superior vena cava and the arch of the aorta and its branches. On either side, and partly in front, is the pleura. It is attached to the thyroid by ligaments. Considerable diversity of opinion exists regarding the growth and involution of the gland, most observers maintaining that it is present in post-fetal life, but there is much disagreement as to the highest point in development, how long it remains, and when and how soon the physiological function is executed.

The thymus suffers the same pathological processes as do other organs: absence, atrophy, hypertrophy, hyperemia, inflammation, tuberculosis, syphilis, and neoplasms. Infectious diseases are common in children, and they commonly produce, according to Hart, a fatty degeneration of the thymic cells. Other infections may also cause degeneration.

**NEOPLASMS.** The literature contains many reports of thymic tumor, but many of them have been confounded with growths from the surrounding structures. They grow slowly, and the first symptoms usually noted are those causing respiratory obstruction followed by signs resulting from pressure on vessels and nerves. It has been observed, even when the surrounding structures are extensively infiltrated, that the thyroid and parathyroids show little tendency to metastatic involvement. It would serve no purpose to discuss the type of tumor, the lymphosarcoma being the most common and the carcinoma probably being the most rare.

<sup>1</sup> Cleveland Medical Journal, 1913, vol. xii, p. 329.

**STATUS THYMICUS.** Much that is strange and mysterious is grouped under this title, and the condition is generally ascribed to those cases in which the exitus is rather sudden, the thymic gland found abnormally large, and no other pathological condition adequate to explain the death. Mayo and McGrath, after calling attention to the typography of the gland and to the observations in the literature, report 2 cases operated on in the Mayo Clinic. In one, a male infant, eleven months old, the patient had suffered from dyspnea since birth, seemingly caused by bronchial obstruction. It would have attacks of convulsions, with cyanosis and coughing. The thymus was ascertained, by percussion and by the  $x$ -ray, to be enlarged, and accordingly the right lobe of the thymus was extirpated; about six months later the child had developed into a fat, normal child. The other case occurred in a male, aged three years. There had been a rapid growth of the thyroid gland for six or seven months and signs of dyspnea, and the  $x$ -ray confirmed the diagnosis of an enlarged thymus. At operation, one-half of the lobe of the thyroid was removed, the isthmus divided, and the left lobe of the thymus extirpated. Immediately after operation the dyspnea was improved.

I refer to these cases as examples of thymic hyperplasia producing serious symptoms threatening life, requiring operative treatment and being completely relieved by said operation. The field is a new one, and there are not more than 50 cases of thymectomy on record. If every physician understands sufficient of the subject to diagnose his case, it is evident that many infants' or children's lives may be saved by operation that would otherwise be lost through ignorance of the possibilities of the surgical treatment. There have been other cases reported during the year, but it hardly seems worth while to recount them all.

In the reported cases, the clinical picture is one of respiratory disturbance with frequent suffocative attacks, aggravated particularly by excitement and by bending the head. There may also be circulatory disturbances. Mayo and McGrath state that the question of thymic pressure is not yet definitely settled. They believe that sudden death must be extremely rare, and severe disturbances are infrequent as a result of thymic enlargement, *per se*. On the other hand, it is reasonable to believe that a moderately enlarged thymus might be capable of producing a disturbance when, in the absence of effectual mechanic conditions, a partly enlarged gland would fail. They believe that the evidence, on some of the cited cases, of the thymic enlargement was only contributory to the essential factor causing the severe symptoms or lethal outcome.

**STATUS THYMOGLYMPHATICUS.** In certain cases of sudden death nothing is found at autopsy except a hyperplastic thymus and enlargement of the entire lymphatic apparatus. The thymic hyperplasia is said not to be as great as in genuine status thymicus, and the condi-



tion differs from pure status lymphaticus in that the latter has a normal or small thymus.

*Clinical Aspects.* From the papers of Crotti,<sup>1</sup> Parker,<sup>2</sup> Schubert,<sup>3</sup> and the monograph of Mayo and McGrath, I have constructed the following picture, although, of course, nothing original is claimed by any of these authors; they bring the subject to date:

Certain cases of asphyxia of newborn babies may be explained only by thymus hyperplasia. The child is borne apparently dead; may be resuscitated, but it then remains cyanotic and dyspneic and, in many instances, dies after a few minutes or hours. The autopsy shows only some asphyxial lesions, and a large thymus displacing and compressing the wind-pipe. Parker mentions that at times enlarged tracheobronchial glands, or spasm of the glottis, are contributing factors in producing the fatal results. Crotti believes that, in some children, a latent thymus hyperplasia may exist, and the child is found in poor general condition and suffering from some vague respiratory symptoms.

Parker divides the affection into two types, the continuous, in which the symptoms usually date from birth or soon after, with permanent dyspnea usually present; the intermittent type, usually of later development, in which there are longer or shorter intervals free from symptoms. The three most important symptoms are dyspnea, recurrent suffocative attacks, and stridor. Dyspnea may be constant or intermittent, with or without acute paroxysms, and varies greatly in intensity. The attack may occur without cause, or when the child cries from pain or anger. Hyperextension of the head exaggerates dyspnea. The suffocative symptoms are caused by compression of the wind-pipe either between the sternum and the vertebra or between the brachiocephalic trunk and the left common carotid. Crotti states that the first form of compression is found mostly in children, the latter in adults. That the trachea is compressed by the thymus has been definitely shown by many observations through the bronchoscope. In some cases, a secondary laryngeal spasm occurs because of the dragging on the inferior laryngeal nerve. In such cases, a spasmodic contraction may be of sufficient consequence to cause death. In such cases, tracheotomy would save the patient. Death may also occur from direct pressure on the base of the heart and its nervous ganglia.

Crotti emphasizes the necessity for distinguishing between thymus enlargement and malformation of the vestibulum of the larynx, tracheobronchial glands, or even adenoids. Congenital stridor is seen after birth, is entirely inspiratory and the symptoms disappear with intubation. The laryngoscopic examination shows the malformation of the superior opening of the larynx. In 1912, I quoted Aviragnet, who

<sup>1</sup> Journal of the American Medical Association, 1913, vol. lx, p. 571.

<sup>2</sup> American Journal Diseases of Children, 1913, vol. v, p. 89.

<sup>3</sup> Beit. z. klin. Chir., 1912, vol. lxxxii, p. 269.

called attention to the difficulty of distinguishing between hypertrophy of the thymus and disease of the bronchial glands. He emphasizes the history of a bronchopneumonia or whooping cough as being of importance; the thymic stridor being congenital. Percussion and radioscopy will reveal different findings. In adenoids the difficulty should not be great, and an examination of the throat reveals the cause of the trouble. Mayo mentions the prominence of the veins, tenseness of the fontanelles, protrusion of the eyes and the puffiness of the veins existing during the paroxysm.

In suspected cases, percussion should outline the area of thymic dulness, constantly much more marked on the left of the sternum than on the right and shifting on change in the position of the head. The value of the *x*-rays in the diagnosis of thymic enlargement has been the subject of much debate. Crotti<sup>1</sup> believes that it is possible in the great majority of the cases to diagnose the case. He described the appearance of the *x*-ray in the following words: "In thymus hyperplasia there is a shadow, which overlaps, laterally, this normal mediastinal shadow. The hyperplasia may affect one lobe more than the other, or both lobes in the same proportion. The shadow is more or less triangular; it extends upward from the region of the auricle in a straight line, or follows, to some extent, the contour of the mediastinal shadow. The region of one or both auricles bulges, as though this auricle would be overdistended and form an angle between the ventricle and the auricle. The base of the heart is enlarged, and this enlargement is not in proportion with the size of the heart. This shadow in some cases is superimposed on the base of the heart like a cap, which would fit right over the base of the heart. The character of the shadow differs extremely from the cardiac and mediastinal shadows. It is thin, transparent, soft, and regularly distributed. The edges are, as a rule, sharply limited and linear." Schubert states that a definite extension of the median shadow to the left side makes a diagnosis of thymic enlargement very probable in children. Enlarged bronchial glands usually produce a shadow on both sides; aneurysms pulsate; intrathoracic goitres give a cup-shaped shadow. He also believes that deviation of the trachea is an important *x*-ray sign of thymic enlargement.

I will not discuss the various bodily conditions and diseases in which status thymolymphaticus has been blamed as the cause for sudden death, because this would not serve the practical purpose of this discussion, with the exception that the relation with simple and exophthalmic goitre is of sufficient importance to the surgeon to warrant a further consideration. A large series of autopsies has shown the combination of thyroid enlargement and persistent thymus, and many writers for years have insisted on the relation between the two organs. Capelle has been quoted in these pages several times as

<sup>1</sup> Journal of the American Medical Association, 1913, vol. lx, p. 117.

believing that the thymus is an indicator of the severity of the case. Many other pathologists and surgeons have written on both sides of this question, and a perusal of the literature shows much diversity of opinion. In the Mayo Clinic, the association of thymic "persistence" or hyperplasia with goitre, both simple and exophthalmic, has been noted, but not so frequently as recorded by some observers. During 1912, the number of operations on the thyroid was 1249, with a mortality of 1.04 per cent. Of ten autopsies performed, the thymus was noted in six, and the amount of thymic tissue varied from a vestige to 40 grams. Four of these cases were exophthalmic goiter. Mayo and McGrath believe that although they are willing to preserve an open mind to the possibility of the effect of the hyperplastic thymus, yet they feel that neither the result of experimentation nor observations otherwise made have scientifically proved the significance attributed to the thymus by some in its relation to goitre.

Seelig<sup>1</sup> reviews the recent literature on the role of the thymus in exophthalmic goitre, and states that it seems almost impossible to avoid the conclusion that, if there really is a close relation between exophthalmic goitre and hyperplastic thymus, no one has determined the why and the wherefore of the relationship. He ends his review by a quotation from Melchior,<sup>2</sup> who has written an interesting monograph on the relation of the thymus to exophthalmic goitre with reference to 151 articles in the literature. Melchior's paper itself is an interesting review, and he concludes that the practical results of the contributors to literature may be summarized as follows: "In florid Basedow, an enlarged thymus (as a rule, a manifestation of status lymphaticus) occurs in from 80 to 90 per cent. of the cases in which operation was followed by death. There is no statistical evidence on which to base the statement that the existence of an enlarged thymus contra-indicates thyroidectomy for Basedow's disease. Furthermore, there is no proof that an enlarged thymus adds an independent source of toxic danger in cases of Basedow. It is impossible to ascertain whether the enlarged thymus is a congenital or an acquired condition; but it cannot be denied that the status thymicolymphaticus may be a general tissue reaction brought about by hyperthyroidism. It may be possible, therefore, that a primary hyperplastic thymus may share secondarily in the general atrophy that occurs as the result of a Basedow cachexia."

TREATMENT. Briefly, when the symptoms of dyspnea, stridor, and suffocative attacks indicate obstruction in the presence of an enlarged thymus, surgical treatment seems at present to be superior to any other. There are a number of observations showing that the *Röntgen ray* is of considerable service, Wyckoff<sup>3</sup> stating that it seems to be the most

<sup>1</sup> Interstate Medical Journal, 1913, vol. xx, p. 678.

<sup>2</sup> Zentralbl. f. d. Grenzgeb. der Med. und Chir., 1912, vol. xv, p. 166.

<sup>3</sup> Cleveland Medical Journal, 1913, vol. xii, p. 341.



efficient treatment. But Mayo and Olivier<sup>1</sup> are in agreement that while the Röntgen exposures may cause a reduction in the size of the thymus, it must be applied in repeated doses, requires considerable time, and seems wanting in precision. Veau and Olivier<sup>2</sup> have collected 48 cases of thymectomy, with 28 complete recoveries and 15 deaths, but of the deaths 7 were not due in any way to the operation of thymectomy. In every new operation the mortality is rather high at first, and especially so in a condition where the patient, usually a child, is in a desperate condition. With increasing knowledge of the technique and of the indications, and with earlier operating, there will no doubt be as little mortality in this as in any other serious surgical operation.

The following technique is described by Mayo and McGrath: A curved transverse incision, which includes skin and platysma, is made low in the neck. The inner borders of the attachments of the sternomastoid muscles are incised; the sternohyoids are cut across. If the thymus be enlarged, it is seen as a pinkish gland projecting into the neck from behind the sternum. The gland may now be caught gently with clamps, and drawn upon until the fingers can be used for direct traction. The vessels are not large, the fascia which incloses the gland is loose, and there is but little difficulty in clamping and ligating as one lobe is removed. If it be deemed necessary, the second lobe can be elevated and a portion of it excised. The cure is complete. A drain should not be used unless indications for drainage are urgent. In case it be advisable, a folded strip of rubber tissue should suffice for the few hours during which the procedure may be necessary.

Olivier makes a median incision from 3 to 5 cm. long, beginning above and terminating 2 cm. below the upper edge of the sternum. This is deepened until a gray mass is exposed, which is seen to rise and fall with respiration. The capsule is incised and the thymus will extrude or enucleate itself; the pedicle is ligatured and the lobes removed, the left first. The cavity is closed by bringing the subhyoid muscles together with catgut sutures, and by approximating the lower ends of the sternomastoid. Parker also prefers the vertical median incision. He states that of the 17 recorded deaths that occurred in thymectomized children, 4 followed a complicating tracheotomy, and, in one, from an unclosed wound with drainage and infection. Four were due to infection from septic tracheobronchial glands. In one, there was a preliminary bronchoscopy; and in another, there had been several unsuccessful attempts at tubage immediately preceding the operation. In 3 cases with incomplete histories, the operator expressly stated that the deaths were not due to the operation itself. One was in a severe case of Little's disease. And, finally, in 2 cases the deaths occurred several weeks after operation from causes remote from, if not entirely

<sup>1</sup> *Archiv. gén. de Chir.*, February 25, 1912.

<sup>2</sup> *Zentralbl. u. Experimental Medicine*, 1912, vol. i, p. 749.

separate from, the operative procedure. In one case was the operation immediately fatal.

**Sarcoma of the Chest Wall.** Tumors of the chest wall, ribs, and sternum may be divided into primary tumors, fibroma, chondroma, sarcoma, and their combinations; and into secondary tumors, sarcoma and carcinoma. The diagnosis of these tumors is not difficult, but the particular variety may be hard to distinguish. They are most frequently located on the sixth, seventh, and eighth ribs, and expand outside of the chest without at first involving the skin muscles, or the intercostal structures. In time, however, the tumor extends by direct growth between the ribs and toward the sternum, involves both vessels and nerves, and then projects into the intercostal space. The pleura is thickened at first, and the parietal layer finally invaded by the tumor. The lung may be deeply indented by the tumor, but, as a rule, pleuritic adhesions are not common. Lund<sup>1</sup> reports the case of a woman, aged thirty-three years, who developed, during three years, a mass in the left axilla about the size of a baseball, projecting into the chest, as shown by the x-ray. A curved incision was made, and the skin and muscles dissected free from the tumor. The third, fourth, and fifth ribs were then divided by an osteotome in front of the tumor and the pleura widely opened. The ribs were next divided behind the tumor, enabling the removal of the mass. The pleura was sponged out, the intercostal arteries tied, and all hemorrhages stopped. Pectoralis major and latissimus dorsi muscles were sewed together across the opening with interrupted sutures of catgut.

The patient was anesthetized by intratracheal insufflation anesthesia, the lung being allowed to collapse during the period when the blood was sponged out, but was subsequently inflated again to fill the pleura while the muscles were being sewn together.

The patient developed a hemothorax shortly after the operation, but was relieved by the withdrawal of the blood from the cavity. The patient was discharged in three weeks, and ten months later was entirely well without any signs of the tumor.

Lund reports the details of 28 cases reported in the literature since Parham's paper, in 1898, in which 52 cases were analyzed. A glance at the cases collected by Lund shows but little difference in the result whatever form of pressure was used, or whether the pleura was simply closed with compresses. It will be found, for instance, that, among the 28 cases, only two died. Lund believes, however, that, entirely irrespective of statistics in cases of equal severity, those operated upon with positive or negative pressure would do better than the same cases operated upon without special apparatus. Also, the same cases operated upon under intratracheal insufflation anesthesia would do still better

<sup>1</sup> *Annals of Surgery*, 1913, vol. lviii, p. 206.

than in the cabinets. Baldwin<sup>1</sup> adds 3 cases to the number collected by Lund. Two were cases of primary sarcoma, and one was of secondary carcinoma. In none of the 3 cases was pressure used; they all had collapsed the lung to a greater or lesser extent, but all made an excellent recovery with practically no shock.

### THE MAMMARY GLAND.

**Tuberculosis.** This rather unusual affection was first described by Richet, in 1880, and since then a considerable number of contributions have been made to this subject. I have referred to it variously in 1904, 1905, 1906, and 1910, and have reported papers based on the association of tuberculosis and carcinoma in 1910 and 1911. Recently, Powers<sup>2</sup> adds 2 cases to those which he has previously reported. He also reports an important communication from Dr. Wilson, of the Mayo Clinic, dated December 7, 1912, which states that "a somewhat careful search of our records here shows that since the laboratory was opened, January 1, 1905, there have been but two cases of tuberculosis of the breast; though during the period over 1000 cases of tumor of the breast were operated upon."

Powers' fourth case is especially interesting, because, although a diffuse, irregular, doughy mass was present in the upper outer hemisphere of the right breast and the entire axilla occupied by large, hard masses, he performed a partial excision for cosmetic reasons and cleared the axilla. The operation was followed by the administration of small doses of tuberculin for several months. The patient gained 17 pounds in weight in six months and is well in every way, with no evidence of tuberculosis elsewhere. This case illustrates the possibility of cure by means of a partial operation, although most of the writers on the subject advise complete amputation. It is well to remember that, in practically all patients, the axillary lymph nodes are involved, as well as the mammary gland, and the operation must be almost as thorough as that done for carcinoma. Exceptionally, as in the case reported by Powers, a partial removal of the affected portion of the breast and the underlying pectoral fascia and the axillary glands may suffice for a reasonable hope for cure. In those patients with advanced pulmonary tuberculosis such a radical procedure may not be advisable, in which case curetting of the sinuses, incision or aspiration of the abscess, or partial removal may be practised. In 1910, I quoted from von Eberts<sup>3</sup> that in those cases in which the disease is discrete, in which chronicity is a prominent feature, and when the patient is young and may need the breast later, a course of tuberculin should be tried before removing the breast. von Eberts administers tuberculin for a year at intervals

<sup>1</sup> *Annals of Surgery*, 1913, vol. lviii, p. 853.

<sup>2</sup> *Ibid.*, vol. lvii, p. 171.

<sup>3</sup> *American Journal of the Medical Sciences*, 1909, vol. cxxxviii, p. 70.



of ten to fourteen days unless hypersusceptibility results. There have been a number of references to the end results in the literature, the contribution by Braendle<sup>1</sup> being the most satisfactory. He reported 11 patients from the Tübingen Clinic, and investigated 5 others. Of these, there were 15 cures; the period of observation ranging from one to nineteen years, although three patients died from pulmonary tuberculosis who were free from local recurrence. Hartwell<sup>2</sup> has reported a case in which an irregular mass was found in the right breast, inflammatory, hard, and boggy, with one tender enlarged gland in the axilla. Only the diseased area was removed, primary union followed and one month after the operation the enlarged gland was no longer palpable.

**Carcinoma.** The literature upon carcinoma of the mammary gland is not extensive, but several interesting articles have appeared during the past year. That there is need for investigation is evident to any one who reads the results of operative treatment. The breast is so superficial an organ that the diagnosis of its diseases should be easy and yet a large number of women, nearly 50 per cent. according to Primrose,<sup>3</sup> are operated on a year or more from the time of the onset of the tumor.

**PATHOLOGY.** The terminology of carcinoma of the breast is most confusing. In no other affection do we have such a variety of names for primary morbid processes. Thus, chronic cystic mastitis has twelve synonyms, and the varieties of carcinoma are almost legion. To simplify the terminology of the histogenesis of cancer is the theme of an essay by McCarty<sup>4</sup> from the Mayo Clinic. He first traces certain embryological or developmental facts, as described in the works on embryology. In certain breasts, usually between lactation or shortly after the menopause, certain changes of a chronic inflammatory nature occur associated with a hyperplasia of the epithelium of the acini. The outer row of cells of the acini, developed from the stratum germinativum, become prominent or hyperplastic, and the line of demarcation between parenchyma and stroma becomes indistinct and the histological picture recognized as carcinoma is produced. The inner row, or secreting cells, are exfoliated and not renewed, and their place is taken by proliferation of the outer row. Wilson does not know the dividing line between hyperplasia and neoplasia, nor why all cases of chronic cystic mastitis are not associated with carcinoma. He distinguishes three grades of hyperplasia:

1. Primary hyperplasia in which both rows of cells exist and take part in the hyperplastic reactions. Such a condition is frequently seen in "chronic cystic mastitis" and benign fibro-epithelial tumors.

<sup>1</sup> *Beit. z. klin. Chir.*, 1906, vol. 1, p. 215.

<sup>2</sup> *Annals of Surgery*, 1913, vol. lviii, p. 396.

<sup>3</sup> *American Journal of the Medical Sciences*, 1913, vol. cxlv, p.100.

<sup>4</sup> *Surgery, Gynecology, and Obstetrics*, 1913, vol. xvii, p. 442.

2. Secondary hyperplasia. The germinative cells are active within the confines of the acinar limits. This hyperplasia is seen in chronic cystic mastitis when the lumen of the acinus is filled with proliferating epithelium derived from the outer row, the inner row having disappeared. Everyone has observed this picture and we are often consulted by students in regard to the certainty of malignancy in such cases owing to the irregularity of the epithelium.

3. Tertiary hyperplasia, recognizable in the extra-acinar or migratory activities of the cells which apparently originate in the germinative layer (cells of the outer row).

MacCarty makes the extremely important statement that there is a "definite pathological foundation for the surgical experience that the conditions described as senile parenchymatous hypertrophy, abnormal involution, cyst adenoma, and chronic cystic mastitis often, if not always, are associated with carcinoma." He also states that carcinoma is apparently an out-growth of the outer row of cells and is not the product of cut-off epithelial cells by scar tissue. He does not believe that it is necessary to wait for the penetration of the "basement membrane" before making a diagnosis of carcinoma. He believes that more benign tumors must be completely enucleated, and more breasts diagnosed as chronic cystic mastitis must be removed in order to save the patient from the ravages of the extensive hyperplastic, migratory epithelial conditions which we call carcinoma.

An interesting case has been reported by Syms<sup>1</sup> in which a woman, aged thirty-nine years, developed a typical condition of chronic cystic mastitis of the right breast, with a distinct tumor in the upper outer quadrant. A radical ablation of the breast was performed, and the first report of the pathologist was that of simple adenofibroma with no evidence of cancer. At Dr. Syms' request, many sections of the specimen were made, and, finally, one was discovered with the histological evidence of cancer. This report is of extreme interest to me and I am presenting Syms' conclusions verbatim, owing to their importance. They are: (1) It emphasizes the fact that this condition of abnormal involution or chronic mastitis (with the production of masses, which histologically may be classed as fibroadenomata or adeno-fibromata) is a very important factor in the development of cancer and must therefore be considered as a precancerous condition or stage. (2) It illustrates the fact that, in these cases, cancer may begin in one part of the gland while such a change may not be found in any other part of the gland. (3) It emphasizes the fact that the detection of such a cancerous change may require the examination of many sections. (4) This being true, it is evident that diagnosis by means of the frozen section must be subject to error in a certain proportion of cases."

<sup>1</sup> *Annals of Surgery*, 1913, vol. lviii, p. 395.

In the discussion of this case and another one by Lee, which has evidently not been published, Hartwell reported a case similar to Syms'. Bertel<sup>1</sup> reports 26 cases of chronic cystic mastitis, in one-third of which malignant formation was evident. Upcott<sup>2</sup> is also an advocate of radical treatment for this disease.

The age of the patient, in suspected carcinoma, is of no moment in making the diagnosis, the experience of the Mayo Clinic showing that the patient's ages ranged from twenty-three to seventy-two years. MacCarty believes that both the pathologist and clinician should accept a simple, biological conception of epithelial activities rather than to attempt a scientific grouping of cases according to an unscientific and chaotic nomenclature. Most of us will heartily agree with him, because it is confusing to read a paper, such as that of Salmon,<sup>3</sup> in which a number of different types of cancer are discussed in terms of prognosis and certain percentages attached depending upon the pathological varieties, the surgeon having no way of knowing the particular variety until after the report is received from the laboratory. Thus, Salmon refers to a solid cancer with 41.9 per cent. of cures; a medullary cancer in which the large alveolar type gives 30.8 per cent. of cures, while the small alveolar resulted fatally in all cases; there is also an infiltrating cancer, with 13 per cent. of cures; an adenocarcinoma, with 71.5 per cent. of cures; cancer cysts, with 56.6 per cent. of cures, and a mucoid (colloid) cancer, with no cures in 2 cases. This observation is in accord with what we have always known, viz., that the so-called adenocarcinoma or malignant adenoma gives a favorable prognosis, as do cancer cysts; whereas the medullary cancer, or the diffuse infiltrating cancer, is more malignant. Bloodgood,<sup>4</sup> in reporting his results based upon the patients who have lived five years or more after operation, states that there were 35 patients operated on for adenocarcinoma who were cured five years or more after operation. This is 76 per cent. of the total number of this type. In the more malignant forms, he had cured 92 cases, or 36 per cent. of the total number.

CLINICAL ASPECTS. There are three papers important enough for our consideration and discussion, and it is interesting to note that they come from different countries. Primrose<sup>5</sup> reports the cases occurring in the Toronto General Hospital in eight years, 158 in number, and 54 private cases operated on by himself; there were four sarcomas included in the statistics of malignant growths. Deaver<sup>6</sup> reports the last 200 cases of carcinoma of the breast observed in the German

<sup>1</sup> *Deutsch. Zeit. f. Chir.*, 1913, vol. cxxiv, No. 1.

<sup>2</sup> *Practitioner*, 1913, vol. xci, No. 1.

<sup>3</sup> *Archiv für klin. Chir.*, 1913, vol. cl, p. 573.

<sup>4</sup> *Boston Medical and Surgical Journal*, 1913, vol. clxix, p. 792.

<sup>5</sup> *American Journal of the Medical Sciences*, 1913, vol. cxlv, p. 100.

<sup>6</sup> *Journal of the American Medical Association*, 1913, vol. lx, p. 795.



Hospital of Philadelphia, and analyzes his results. Salmon<sup>1</sup> describes the experience of the Bier Clinic in Berlin. He compares the anatomical details with the clinical findings and the ultimate outcome. The latter article is based on 200 cases of mammary cancer; 108 patients were examined at varying intervals after operation, of which 20 were operated on only two or three years previously. These three writers take up the subject from different angles, and it is not entirely possible to bring them into parallel columns, but, from their experience, the following may be gleaned:

For the information of those interested I append the comparison of the age incidence in the 200 cases reported by Deaver and in Primrose's 216 cases. The importance of this table is apparent when it is noted that 16 or 17 per cent. of the cancer cases occur in women under the age of 40 years. The average age, in Deaver's cases, was 49.6 years; in Primrose's, 49.2 years; in the Mayo Clinic (reported last year), 55.5 years.

Under 30	. . .	Deaver	2.5 per cent.	Primrose	3.4 per cent.
30 to 40	. . .	"	16.0 "	"	17.5 "
40 to 50	. . .	"	32.5 "	"	40.0 "
50 to 60	. . .	"	32.5 "	"	19.0 "
60 to 70	. . .	"	9.5 "	"	14.0 "
Over 70	. . .	"	7.0 "	"	5.6 "

Deaver's youngest case was twenty-two years old; Primrose's, twenty-eight years; Judd's, twenty-one years. Seventy-seven per cent. of Primrose's cases were married; 81.5 per cent. of Deaver's. Fifty-five per cent. of Deaver's cases had borne children, and in 47.5 per cent. the cancer appeared before the menopause.

In the great majority of cases the disease runs a symptomless course in its early stages, and in the majority (78 per cent., Deaver) the "lump" is the first symptom noted by the patient. In a small percentage, pain is the first symptom, but, beyond these two, no other symptoms are constant or important. Some patients are sent to the surgeon for some other disease, and the breast cancer only noted during a routine physical examination. A few years ago a woman was admitted to my service in the University Hospital suffering with an umbilical hernia; she also had a Paget's cancer of the breast. It is quite important that physicians understand the facts about the symptom pain because, while it frequently occurs (65 per cent., Deaver; 24 per cent., Primrose), it is a late manifestation and not an early one. Curiously, Primrose and Deaver are almost alike in their statistics in the incidence of trauma, 12 and 13 per cent. respectively. Trauma, therefore, while perhaps of importance in the etiology, is of but little importance in the diagnosis.

<sup>1</sup> Archiv für klin. Chir., 1913, vol. cl, p. 573.

Murphy believes that the relation of trauma to carcinoma of the breast is peculiar. Unlike cancer of other regions of the body where chronic irritation or repeated slight trauma are considered of prime etiological importance, in the breast one single trauma of moderate severity may produce a carcinoma after the lapse of from six to thirty months. This is a very wide generalization to make, because the breasts are so very liable to accidental blows in the ordinary course of events, and women are very apt to remember some particular trauma that otherwise would have been forgotten.

"The opportune time for surgery in mammary carcinoma is in the presence of a symptomless, freely movable mass." (Deaver.) That patients are rarely seen by the surgeon in this stage is well known.

**PROGNOSIS.** The results at the present time, following operative treatment, are very bad. The condition of the patients at the end of three years are considered from somewhat different standpoints by the three writers and are not exactly comparable. Deaver traced 75 cases beyond the "three year limit," and found 16 (21.3 per cent.) free from recurrence on an average of seven years from operation; 37 died of recurrence, 4 of causes other than cancer, and 6 have recurrences at the present time. The remainder are apparently well, but sufficient time has not elapsed to make this certain. Of the patients well after three or more years, only 12 per cent. had retraction of the nipple (50.3 per cent. of the total number had retraction), and 18 per cent. showed attachment of the tumor to the skin (70 per cent. of the total had it), but in none of the "cured" cases was the tumor attached to the pectoral fascia. Salmon states that 75 per cent. of the cases were cured when there was no attachment to either skin or pectoral fascia; 35.3 were cured when the attachment to only one of these structures had existed, and only 9 per cent. were cured when the cancer involved both. After making certain corrections, Salmon reports 33.5 per cent. of cures in 108 cases traced out of 200 operated on. He lays particular stress on the type of cancer as an indication of the possibility of cure. The cancers displaying the least anaplasia give a favorable prognosis, the most anaplastic forms (scirrhus and small-celled soft) give a grave prognosis. Bloodgood<sup>1</sup> has 42 per cent. of cures in all cases of cancer in which complete operation could be done and in which the period of time since operation is five years.

Primrose did not trace his cases, but he presents an interesting table of the average duration of the disease at the time of operation. The average duration of all cases was 14.375 months; only 54.5 per cent. came to operation less than one year from the date of onset; 35.4 per cent. less than six months; 19 per cent. less than three months, and 8.4 per cent. during the first month of trouble. In Deaver's series, the average length of time the disease had existed was thirty months.

<sup>1</sup> Boston Medical and Surgical Journal, 1913, vol. clxix, p. 792.

In the cases in which the patients were well three or more years after radical treatment, sixteen months had elapsed, on the average, before operation. This observation of Deaver's is of extreme importance because it does not agree with Greenough's<sup>1</sup> oft-quoted observation that "no constant increase or diminution of successful operations is observed with increasing duration of the tumor."

Bloodgood's figures<sup>2</sup> are particularly interesting in this connection. He divides his cases into early and late ones; but does not clearly indicate how he distinguished between the two groups. His results from adenocarcinoma can be expressed as follows:

All cases (35), 76 per cent. of cures.

Early cases (15), 100 per cent. of cures.

Late cases (20), 64 per cent. of cures.

The figures 35, 15, and 20 represent the actual number of cured patients, and not the total number subjected to operation, except in the group where there was 100 per cent. of cures.

The results in the more malignant form of cancer of the breast show the same difference in the results between early and late cases, as follows:

All cases cured 92, or 36 per cent.

Early cases, 12 cured, or 85 per cent.

Late cases, 80 cured, or 33 per cent.

Another interesting observation made by Bloodgood is that by excision of the lump in a woman's breast, without further interference, we practically destroy her chance for recovery in the vast majority of cases. He had only one positive cure, and in this case the entire breast was removed and nothing further was done. The properly educated surgeon should always be able to diagnose the early cancerous lump in the breast and perform the complete operation immediately after the exploration. If he delays for a week or ten days until the microscopic report of a suspected mass is made, his patient's chances for ultimate cure are practically *nil*. I agree with both Deaver and Primrose that injudicious operations should not be undertaken. Visceral involvement, bone metastasis, invasion of the bony frame-work of the chest wall, extensive supraclavicular involvement, etc., indicate a hopeless malignancy. In the Mayo Clinic, if the supraclavicular glands are enlarged, they excise one under local anesthesia; if it proves to be malignant, no operation is advised.

TREATMENT. There is nothing to discuss about the treatment of cancer of the breast that has not been gone over many times before. We have been urging for years that patients should be submitted to operative treatment for cancer at an earlier period than they now are. It is discouraging to read that 25 per cent. of the patients presenting

<sup>1</sup> Surgery, Gynecology, and Obstetrics, 1907, vol. v, p. 39.

<sup>2</sup> Boston Medical and Surgical Journal, 1913, vol. clxix, p. 792.



themselves to the Mayo Clinic were inoperable because of advanced cancer of the breast, and that 31, of the last 200 cases in the Deaver Clinic, had extensive ulceration and metastasis. The report of the Pennsylvania State Cancer Commission showed that maladvice was given by the physician in 13 per cent. of the breast cases.

This is appalling, and we can only hope that the time will come when the detection of a lump in a woman's breast will inspire, in both patient and doctor, the desire for its removal.

An important article has appeared from the Johns Hopkins Clinic, written by Dr. Halstead,<sup>1</sup> the pioneer of modern breast surgery in this country. This paper describes a modification of his original method of operation so well known to everyone. These modifications were devised, (1) because of occasional necrosis of the tip of the axillary flap and subsequent infection; (2) the influence of this infection in delaying healing by skin grafting; and (3) the disability caused by inability to fully bring the elbow up to the head.

In order to overcome these defects, the incision down the arm was abandoned and the vertical cut to the clavicle made as short as feasible, when considerable skin has been removed. A circular incision surrounding the tumor and usually two short vertical incisions are made, one above and one below. The skin of the outer flap between these two vertical incisions is utilized primarily to cover completely, without any tension, the vessels of the axilla. "The edge of the flap is stitched by interrupted, buried sutures of very fine silk to the fascia just below the first rib in such a way that the skin partly envelops the large vessels. Then, along the entire circumference of the wound, the free edge of the skin is sutured to the underlying structures of the chest wall, the wound being made as small as desirable in the process of closure, and tension on the upper or axillary part of the outer flap assiduously avoided. Considerable traction may, however, be exercised on the mesial flap and on the lower portion of the outer flap. Whatever the size and shape of the grafted defect, it should usually extend to the top of the axillary fornix. Thus the thoracic or inner wall of the apex of the axilla is always lined with skin-graft.

The arm is abducted 90 or more degrees during the stitching of the wound and is not included in the dressing. Only the gentlest pressure is exerted by the bandage holding in place the gauze handkerchiefs, which should be evenly applied with solicitous care. Particularly to be avoided is the placing of a wedge of gauze in the axillary fornix, and using this as a kind of fulcrum to be bridged over by the adducted arm. Drainage is unnecessary. Movements of the arm, as free as possible, are encouraged after the second day. These may be executed without any apprehension if the wound is closed in the manner indicated." Halstead also discusses some interesting observations in regard

<sup>1</sup> Journal of the American Medical Association, 1913, vol. ix, p. 416.

to *skin grafting*. He believes that it is better to remove too much skin than too little, because, if the covering is properly done, it does not matter whether the grafted area is large or small, the time required for healing is just the same. He has also noted that skin grafting presented a definite obstacle to the dissemination of carcinomatous metastasis. He has seen a number of cutaneous recurrences without any involvement of the graft and he believes, from this observation, that in those cases with a special tendency to skin metastasis, a moat might be formed. He suggests simple incision through the skin to the sheaths of the muscles or the excision of a narrow strip of skin with immediate grafting in either case. Finally, he states that where recurrence occurs in the deep planes, it can easily be detected beneath the thin grafted skin, but is concealed for an indefinite period beneath the normal skin.

Halstead's remarks, apropos of skin grafting, appeal to me as more rational and less mutilating than the other procedures devised to cover an extensive defect after amputation of the breast. Halstead himself disapproves of the suggestion to cover the defect by transfer of the opposite breast, principally because the denuded area would be too deeply covered to detect early recurrences. The same objection would hold to the Tansini operation, in which a large flap is dissected from the side and back and turned on its pedicle toward the front. A complete description of the Tansini technique is given by de Roulet.<sup>1</sup>

RÖNTGEN RAYS. In inoperable cancer of the breast, Röntgen treatment offers a reasonable hope of relieving the patient of the symptoms of the disease, and it may prolong life. There is much uncertainty as to the action of these rays, but there are numerous cases on record testifying as to good results, and a few cases, almost unbelievable, in which cure is said to have occurred. Unfortunately, such cases are used in a unfair way to argue against the only certain method of treatment that he have at the present time, viz., the radical removal by operation. It should be remembered that there are just as many cases on record in which a clinically certain cancer of the breast has disappeared without any treatment. But these cases, as well as those said to have been cured by the *x*-ray, are few and far between, and the vast majority of patients with cancer of the breast die from their disease unless the cancer in its entirety is cut away. Even operative treatment has not much to boast of, but it would have if it were possible for the knife to cut through sound tissue entirely around the cancer. An interesting paper upon this subject has been written by G. E. Pfahler.<sup>2</sup> His report is based upon the study of 12 cases considered inoperable, and represents his experience during fourteen years. The description of the results makes interesting reading; the patients were relieved of the symptoms of the disease for from one to eight years,

<sup>1</sup> American Journal of Surgery, 1913, vol. xxvii, p. 92.

<sup>2</sup> New York Medical Journal, April 26, 1913.

and were able to live comfortably and, in most instances, to attend to their household affairs. Case IX is particularly interesting: a woman, aged forty-five years, had had an amputation of the right breast and dissection of the axilla, the microscopic examination showing scirrhus cancer of the breast. In a month there was distinct recurrence in the wound, in the axilla and the supraclavicular region. At the same time, a tumor in the left breast increased in size, and there was involvement of the axilla. Very active daily treatment was given to both sides; in all, 186 applications were made, and at the end of nine months no distinct evidence of the disease could be recognized. Then the left breast was excised, and a pathological study showed no evidence of malignancy anywhere, merely a chronic diffuse fibrosis of the breast.

Now, Pfahler believes that both breasts were involved with cancer, that he cured the recurrence and that he cured the cancer in the left breast and in the left axilla. He says that no one doubted the malignant character of the tumor in the left breast, but I think he should not lay too much emphasis on this case because, while all of his claims may be true, yet it is also true that the patient may have suffered from a so-called chronic cystic mastitis in the breasts with malignant proliferation in the right breast. One does not like to be too severe in criticising this paper, because Dr. Pfahler is so reliable and such a good technician. One statement I would like to dwell upon and that is, as Dr. Pfahler remarks, "this treatment involves a struggle and a considerable expense." Sooner or later we will have to make provision in our hospitals for the more general use of the *x*-ray and also for its greater availability to patients generally.

**RADIUM.** The results of treatment<sup>1</sup> carried out at the Radium Institute was reported last year and furnishes authoritative opinion upon the value of this substance. It was used in 73 cases of cancer of the breast with failure in 38 and more or less success in 35, in none of which was cure claimed. The results, on the whole, were encouraging, especially when the primary growth is of the sclerotic rather than of the medullary type, and when the secondary deposits occur in the skin lymphatics and lymph nodes and there are no internal metastases. A. E. H. Pinch, the author of the report, states that radium should never be used as a substitute for operative interference, but that, when the case is inoperable, it will do much to relieve pain, promote healing of the ulcerated surfaces, and check the growth of the secondary deposits. It may bring about absorption in the superficial nodules, may benefit the swollen arm on the affected side and, in a few instances, there are indications that it has had some effect upon carcinomatous deposits in the lungs. The whole subject of radium therapy is in the stage of experimentation, and it is not even known which of the rays, alpha or gamma or beta, are of the most use.

<sup>1</sup> British Medical Journal, 1913, vol. i, p. 149.



# SURGERY OF THE THORAX, EXCLUDING DISEASES OF THE BREAST.

BY GEORGE P. MÜLLER, M.D.

It is apparent to those who have followed the literature upon thoracic surgery during the past few years that while there has been an abundance of literature on the subject, and many new and ingenious methods of technique have been proposed, the difficulties are so great that progress has been slow. Many suggested lines of new treatment have had nothing to support them save mediocre, or even bad, results. The various contributions that have seemed worth while were discussed from year to year by Dr. Frazier, and a glance backward impresses me again with the slowness of progress in surgery of the thorax. For instance, in 1908, 125 cases of wounds of the heart were collected, with 42 per cent. of recoveries; in 1913, 218 cases were collected, with a recovery rate of 44.5 per cent. During all these years, the surgery of the esophagus presented a continuous chapter of failure, and it is only in the past year that success has been apparently attained. The ease with which pneumothorax may be avoided by the use of intratracheal insufflation anesthesia has given an impetus to work in this field, and we may be assured of progress in the near future. I have thought it worth while abandoning the effort to abstract all of the important papers bearing on the surgery of the thorax each year, and, instead, intend to present three or four phases more completely, gathering up the literature for two or three years in each article.

**Intratracheal Insufflation Anesthesia.** This subject has been discussed several times in the previous March issues of *PROGRESSIVE MEDICINE*. Probably everyone is aware of the methods of use, and it is not necessary at this time to discuss its advantages or disadvantages. The cumbersome positive and negative pressure cabinets are things of the past, and we must devote our attention to perfecting the intratracheal, pharyngeal, intranasal, and the positive pressure mask methods of administering an anesthetic.

Robinson<sup>1</sup> has collected 1402 cases of intracheal anesthesia from 35 surgeons and anesthetists. Of these, 7 died after the operation, of which two were credited to the method. In one, a bronchopneumonia was induced, and in the other death occurred following emphysema, in

<sup>1</sup> Surg., Gynec., and Obstetrics, 1913, vol. xvi, p. 296.

which it is stated that a rupture of the lung took place as a result of the tube being forced, by an assistant who was holding it, into one of the main bronchi, the apparatus not having been fitted with a safety valve. According to Robinson, pneumonia occurred in 6 cases, bronchitis once, and tracheitis or pharyngitis 18 times. I agree with Robinson that the low percentage of tracheal and pharyngeal irritation reported is not due to the fact that they are absent, but rather because they are so slight, as a rule, that the patient does not make the fact known unless asked. We had several cases of "sore throat" last fall, and were surprised, upon questioning the patients who had had intratracheal anesthesia, to find that a number of them complained of this scratching sensation. It is never serious, however, soon disappears, and, in view of the well-known safety of the method of anesthesia, can be generally disregarded.

In the University Hospital we have been using this method of anesthesia for some time, and have had no serious results that may be attributed to the method; at first we used a modification of the Elsberg apparatus, but, during the past year, have been using an apparatus which I devised, and which is simple, compact, and perfectly satisfactory. All who have written regarding intratracheal ether anesthesia have discussed its advantages, not only in chest surgery, but also in operations upon the head, face, mouth, and neck. We find it absolutely invaluable in operations on the mouth, such as resections of the jaw, lip, or tongue; in operations upon the head and neck we have been substituting the intranasal tubes recently because it seemed unnecessary to risk traumatism of the respiratory tract. The method is also valuable in upper abdominal surgery, in cases of intestinal obstruction in which fecal vomiting is feared, in feeble and debilitated patients in whom the effort of breathing may be a strain, etc.

Two important contributions appeared during the past year concerning the technique of this method. Jackson<sup>1</sup> writes upon the technique of insertion of the intratracheal insufflation tube. Formerly I have had the head of the patient dropped over the end of the table in the so-called Boyce position, when introducing the speculum. Jackson, however, now advises the following method: Remove the pillow from the patient, place the thumb of each hand on the forehead of the patient and force the occiput backward as far as possible. The effect of this is to throw the hyoid bone and all the tissues of the neck, including the larynx, high up, and to elevate the tongue. The speculum is then introduced in the usual manner, and the catheter passed. The illustration (Fig. 13) shows better than words the method of introduction.

The other contribution is that by Connell,<sup>2</sup> who describes an apparatus for the automatic measuring and mixing of vapors and gases used to

<sup>1</sup> Surg., Gynec., and Obstetrics, 1913, vol. xvii, p. 507.

<sup>2</sup> Ibid., p. 245.

maintain anesthesia and for other purposes. The description of the apparatus, anesthesiometer, Connell calls it, is too technical to abstract. Briefly, the apparatus consists (1) of a gas meter as the measuring and motive mechanism; combined with (2) an ether reservoir from which volatile liquid is fed in accurately adjustable amounts into (3) a vaporizing chamber, which is combined (4) with a trip-valve, by which gases in any quantity may be mixed in accurate percentage. I have not seen the apparatus in use. At first sight it appears too complicated for the ordinary anesthetizer encountered in the vast majority of our hospitals, but this complication may only be apparent. It should have its widest use in the accumulation of accurate data regarding anesthesia.

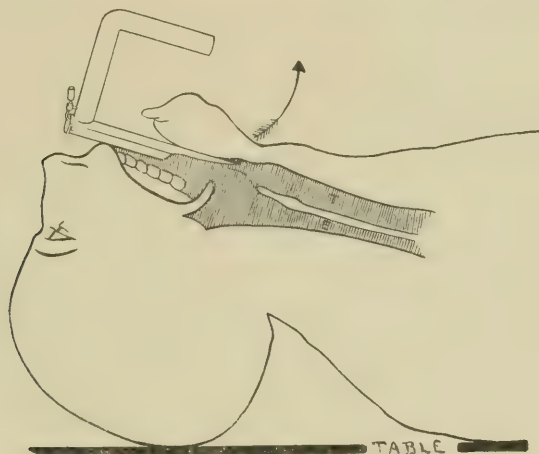


FIG. 13.—Schema illustrating the direction of motion to be imparted to the laryngeal speculum in exposure of the larynx for the introduction of ether insufflation tubes.

**Surgery of the Heart.** A number of cases have been reported of wounds of the heart, but it hardly seems worth while to go on collecting them from year to year simply to report the percentage of recoveries and deaths. The most recent compilation is that of Leotta.<sup>1</sup> This showed a recovery in 44.91 per cent. of 236 cases in which the heart was sutured. When the left ventricle was the seat of the injury, 46.29 per cent. of the 108 patients recovered; 39.28 per cent. of 84 patients with the wound in the right ventricle; 77.77 per cent. of 9 with the wound in the left auricle, and 42.5 per cent. in the right auricle. One patient, with both left auricle and ventricle injured, died, and one of two with both right auricle and ventricle injured. I will give space to one article only because the technical features are described so carefully that the paper seems worth while. In reporting 5 cases of suture of the heart, Stewart<sup>2</sup> calls attention to the following:

<sup>1</sup> Policlinico, 1913, vol. xx.

<sup>2</sup> Annals of Surgery, 1913, vol. lviii, p. 67.



**DIAGNOSTIC FEATURES.** He calls attention to the difficulty in diagnosing the existence of a heart wound even in cases in which the external wound was directly over the heart. He has observed 7 cases in which he was certain that the heart had been injured, but in which exploration revealed no wound in the heart. In 2 cases of gunshot wound, the pericardium had been grazed and contused, but not penetrated; in another, the bullet had lodged in the pericardium, and the heart was contused. In 2 cases of stab-wound, the knife had passed between the pericardium and the lung, and in 2 other cases of stab-wound of the precordium in which the general phenomena of shock was so pronounced as to suggest the possibility of injury to the heart, it was found that the knife had not even entered the thoracic cavity. No conclusion could be drawn from the amount of external bleeding; in none of the cases of cardiorrhaphy was the bleeding more than a trickle. Stewart gives as the reason for this the fact that it is impossible with a single thrust of a narrow-bladed knife to create a straight channel from the skin to the heart. In all of his cases the wound in the heart was above the wound between the ribs, and, in three, the cutaneous wound was on a level with the interspace next above the one that had been perforated, thus making the tract V-shaped. Another reason for the absence of external bleeding is because of the existence of the large pericardial and pleural cavities into which blood may flow unhindered. A bleeding intercostal or internal mammary artery, unassociated with a wound of the pericardium or the pleura, may give rise to considerable external hemorrhage, whereas a wound which involves the pericardium or the pleura may exsanguinate the patient without pouring blood through its external orifice.

In four of Stewart's cases, the local signs of hemopneumothorax were present, and in these cases the area of cardiac dulness was replaced by tympany; in one case in which the pleura was not injured, the area of cardiac dulness was greatly enlarged. In 4 of the cases the heart sounds were faint, but distinct; in the fifth, the heart gave no audible evidence of its activity. There were no adventitious sounds.

General symptoms of shock and acute anemia were pronounced in all cases. The pulse, while exceedingly weak, was not very high in rate. Distention of the veins of the face, neck, and arms, indicating pressure on the auricles as the result of hemopericardium, was present in only one case. Stewart states that doubtless the Röntgen ray would be of marked value except that there is never time in the emergency. Finally, he states that, aside from the signs of hemopericardium and cardiac compression which, following a penetrating injury capable of reaching the mediastinum, always indicate involvement of the pericardium or the heart, there is nothing to render a diagnosis of a wound of these structures certain except direct palpation or inspection.

*Technique.* The skin should be disinfected with strong tincture of iodine, the orifice of the external wound excised, and an endeavor made to locate the further wound by digital examination. A chondroplastic flap is then made, its size and shape varying according to the amount of room necessary to expose and suture the wound in the heart. It makes no difference which way the flap is turned if the lung is collapsed, but if the pleura had not been injured, it is of the greatest importance to preserve that membrane intact, and this can best be done by turning the flap to the left. The pericardial opening is enlarged in the axis of the heart, and the latter grasped. Stewart states that inspection is useless, and the wound cannot be seen unless the bleeding is controlled temporarily by digital compression and the blood removed by sponging. The wound is then sewed with a continuous suture, the needle passed deeply without reference to systole or diastole, and, although silk was used in the first two cases, Stewart evidently prefers catgut. In one of his cases it was necessary to tie a descending branch of the left coronary close to its organ, and yet the patient recovered, and was apparently not inconvenienced by the obliteration of his coronary artery. At autopsy, however, five years after the accident occurred, it was found that the walls of the left ventricle were the seat of an interstitial myocarditis, and in one place near the apex greatly thinned. The patient had died of pulmonary tuberculosis.

All of the blood-clot should be scooped out from behind the heart, and the wound in the pericardium closed without drainage. He states that drainage does not prevent infection, but rather favors it; if pus accumulates later, drainage is, of course, indicated. He states that he would not drain the pleural sac, although this was done in 4 of the 5 cases.

Stewart would now employ the Auer-Meltzer insufflation apparatus during the operation, would remove all the blood from the pleural cavity and close the thorax completely. If the insufflation apparatus is not at hand, the thorax should be closed, and the air withdrawn by aspiration. Of the 5 cases, 3 recovered and 2 died, although one of the recovered cases succumbed, as has been said, to tuberculosis five years after the accident.

The importance of avoiding pneumothorax is minimized by DeVer-teuil,<sup>1</sup> who reports 2 cases of penetrating wound of the heart treated by operation, and thinks that there may be advantages in opening the pleural cavity. In the first place, owing to the collapse of the lung in the upper part of the thorax, the pericardium and heart are more completely exposed, and, secondly, the pleural cavity may be thoroughly examined and cleansed of all blood clots. He sees no necessity for making the incision first used and described by Parozzain, the trap-

<sup>1</sup> British Medical Journal, 1913, vol. i, p. 764.

door method. He prefers an ordinary straight-forward incision, which, if necessary, could be further increased by making transverse incisions at right angles to it, as suggested by Waring. He prefers fine silk for closing the wound in the heart unless the wound is obviously septic, when chromicized or iodized catgut should be used. He states that complete exposure of the pericardium and heart can easily be obtained by removing the fourth and fifth costal cartilages instead of the fifth and sixth, or the fourth, fifth, and sixth as recommended by some, thus leaving the sixth rib as a support to the heart when the patient is in the erect position.

**Cardiolysis.** In 1902, Brauer suggested the possibility of relieving the effect of adhesion of the pericardium by removing some of the bony and cartilaginous frame-work of the thorax. Brauer believed that the precordial part of the chest wall would thereby oppose less resistance to cardiac expansion, but it is probable, as pointed out by Simon, that the removal of tough adhesions of the ribs affords as much relief as the decompression. Simon<sup>1</sup> last year reported the case of a boy, aged fifteen years, who appeared to be at the point of death from cardiac failure supposed to be secondary to adhesions of the pericardium to the heart muscles and to the surrounding tissues and organs. After every method of treatment had failed to relieve, a cardiolysis was performed by Mr. Barling on June 17, 1912. A flap of skin was turned up, and about four inches of the sixth, seventh, and eighth costal cartilages and ribs on the left side removed. During the operation, the pleura was opened in two places and a pneumothorax produced, but without harmful results. Good results were almost instantaneously noted; in four days the pulse had fallen from about 120 to 40 beats per minute; the diastolic bruits disappeared, and the patient gradually became more comfortable, less cyanosed, less dyspneic, and improvement of the ascites and edema of the legs was remarkable. This improvement continued until the end of October, 1912, when the patient gradually became worse and began to fail, and the old symptoms reappeared. Death occurred at the end of March, 1913.

In a second report, Simon<sup>2</sup> reports the necropsy record and states that it is the first time the sequel of a case of cardiolysis has been recorded. The details of the autopsy may be omitted, but the following is the report of the examination of the thorax:

Universal adhesions; many of the adhesions were edematous, broken down easily, and looked fresh; others were dense and firm. The heart and pericardium were extremely large, measuring 6 by 5½ inches, with marked recent and old adhesions to the chest wall, to the operation scar, and to the lungs. The pericardium was universally adherent to the heart and could be separated in patches only, and that with the

<sup>1</sup> British Medical Journal, 1912, vol. ii, p. 1649.

<sup>2</sup> Ibid., 1913, vol. i, p. 1050.



greatest difficulty. The heart cavities were considerably dilated. There was a slight thickening of the mitral cusps. (Some functional regurgitation.) The other valves were quite normal in appearance. The heart muscle was quite pale and very flabby, and showed marked hypertrophy. The left ventricular wall was  $\frac{3}{4}$  to 1 inch in thickness. The pericardium was very adherent to the diaphragm, and there were marked adhesions around the inferior cava, the superior vena cava, and venæ innominatæ. All these veins, together with the jugular vein, were much distended with blood. The left internal jugular measured one inch in width. These veins were traced along their whole extent, and no constriction or stenosis was found, even where they were enveloped in fibrous tissue. The left lung was considerably retracted. There was a fair amount of straw-colored fluid in each pleural sac, and there were many adhesions. Both lungs showed marked edema, and the lower lobe of the right lung was consolidated. The pulmonary veins throughout the lung seemed distended, and their walls showed up very distinctly; they did not appear to be distended.

Simon calls attention to the dilatation of the jugular veins, an observation made by Barlow, and to the posterior adhesions, Keith believing that the symptoms were largely due to these. Simon believes that the ascites and cyanosis were due to nipping of the inferior and superior cavæ respectively, and he was of the opinion that the disappearance of the bruits proved that they were not due to endocardial changes, but rather to distortion of the valves and the heart cavities. While he cautions against generalizing from a single case, yet the experience in this case suggests that if there are evidences of pathological adhesions to the diaphragm it would be wise to divide some of them.

The first case reported from this country, that I am aware of, is that of Dunn and Summers.<sup>1</sup> The case history is as follows: Male, aged twenty-nine years; "had diphtheria at eleven followed by paralysis." Present condition began gradually about three years ago with bloating, shortness of breath on exertion; his condition gradually became worse until he was entirely incapacitated: At present has dyspnea, orthopnea, and a dusky red face; the veins of the neck were turgid, and a marked venous diastolic collapse was present; there was a violent pulsation in the precordium, Broadbent's sign was present and cardiac dulness extended 3 cm. to the right of the sternum and to the left as far as the anterior axillary line into the sixth interspace. Auscultation reveals a loud systolic murmur heard over the entire precordium, but best heard at the apex. Patient was placed in the hospital, where, in the course of three weeks, compensation was restored; the heart action became regular, the murmur entirely disappeared, and the heart sounds became clear. The patient's temperature was normal during the entire

<sup>1</sup> American Journal of the Medical Sciences, 1913, vol. clxv, p. 74.

time. Ten days later (March 13, 1912) cardiomyolysis was performed by Dr. J. E. Summers. The purpose of the operation was not only to untether the heart by doing away with the costopericardial adhesions, but also to give the enlarged organ room for freer play. A U-shaped incision, commencing four inches from the sternum, was made, with its base directed toward the left shoulder, the upper limb skirting the lower border of the second rib as far as the sternum, thence the curved portion overlapping the left border of the sternum to the cartilage of the sixth rib, the lower limb continuing downward, outward, and then upward to the anterior axillary line. A musculocutaneous flap down to the ribs was raised, and the third, fourth, fifth, and sixth ribs and their cartilages, covered by their periosteum and perichondrium, were resected flush with the sternum. This exposed the pericardium and left pleura in an area measuring, from above down, five inches; from within out, four and one-half inches. The pericardium was found adherent to the chest wall, and the pleura somewhat thickened and adherent. It was not necessary to ligate the internal mammary artery, as the costal cartilages were first divided externally to the course of this vessel, and then the inner stumps were removed. The wound was closed with a cigarette drain at its lower angle, which was taken out at the end of twenty-four hours. The operation was followed by a mild bronchopneumonia, from which the patient's compensation was little disturbed. In other respects, convalescence was uneventful.

A second case has been reported by Dowd.<sup>1</sup> The full report is as follows: The boy had suffered from cardiac disability for five years, following rheumatism, of which he gave a history of repeated attacks, at one time being confined to bed for three months. At the time of his admission to St. Mary's Hospital for Children, on October 25, 1912, his dyspnea was excessive. He was unable to lie down nor could he take any exercise. He complained of precordial pain, and coughed after exertion or upon reclining. Both physical examination and radiographic findings indicated an enormous cardiac enlargement. The right border of the heart was to the right of the sternum, and its left border was at the anterior axillary line. The apex beat was in the fifth intercostal space, three and a half inches to the left of the median line. There was a loud, rough, systolic murmur at the apex, which was transmitted to the left. The pulmonic second sound was accentuated. The extremities were edematous. After careful hospital treatment for two months, the boy showed slight improvement, but, upon returning home, his symptoms quickly recurred, and he was readmitted to the hospital. Operation was performed on January 31, 1913: About two and a half inches were taken from the anterior ends of the left third, fourth, fifth, and sixth ribs, and their cartilages, leaving a little of the posterior

<sup>1</sup> *Annals of Surgery*, 1913, lviii, p. 662.

periosteum, as recommended by Fritz Koenig, but clearing it very thoroughly, as suggested by McEwen. After this hard portion of the chest wall was removed, the remaining portion moved very freely with the cardiac pulsations. The boy's convalescence was interrupted by an attack of bronchopneumonia, but at the present time, nearly three months after the operation, he is slightly better than he was before he had been operated on.

Another case was reported last year by Delageniere,<sup>1</sup> but I have been unable to obtain the original article. He evidently made a large flap outlining the whole precordial region and resected the entire bony structure of the chest which overlays the heart. The patient was immensely improved by the operation and relieved of all symptoms.

If one is able to judge by the reported instances, this operation offers considerable hope for the improvement of those cases of mediastino-pericarditis in which the heart and large vessels are fixed to their surroundings, in which the descent of the diaphragm is inhibited, and in which respiration is defective. About 38 cases have been reported, with one death from operation, 31 successes, and 6 failures. It is difficult to point out clearly the indications for cardiolysis. It has its best use in simple adhesive mediastino-pericarditis with systolic retraction at the apex, diastolic shock, Broadbent's sign, etc. Those cases complicated with effusion in the pericardium, pleura, and peritoneum (multiple serositis) are not good cases for the operation. Tornai<sup>2</sup> calls attention to the value of a circumscribed sinking in of the thoracic wall over the centre of the left costal arch between the parasternal and anterior axillary lines and accompanied by pulsation. This, he thinks, is pathognomonic of adhesive pericarditis. In addition, the preference of the edema for the upper part of the body and the paradoxical engorgement of the veins in the neck during inspiration are of value in the diagnosis. Röntgenoscopy may show that the entire heart moves with the excursions of the diaphragm.

**Surgical Treatment of Tuberculosis.** In the effort to aid in the treatment of tuberculosis of the lungs, surgeons have from time to time offered various suggestions as to methods of surgical (mechanical) procedure. These have mostly been devised either to attempt to rid the patient of the cavity, or to allow collapse of the abscess wall and thereby promote healing. From time to time in the March issue of *PROGRESSIVE MEDICINE* Dr. Frazier has referred to the subject, and in the September numbers Dr. Ewart has also discussed the subject. In a most interesting and unusual contribution by Dr. Ewart<sup>3</sup> last September, the mechanical treatment and the use of artificial pneumothorax are referred to in several places. He presents a tabular view of the surgery

<sup>1</sup> *Archiv prov. de Chir.*, 1913, vol. xxii, p. 317.

<sup>2</sup> *Berlin. klin. Woch.*, 1913, vol. 1, p. 1791.

<sup>3</sup> *PROGRESSIVE MEDICINE*, 1913, vol. xv No. 3, p. 17.



of pulmonary tuberculosis which is quite complete. But neither in this article nor in the previous contributions from Dr. Frazier has any serious attention been paid to the indications for producing artificial pneumothorax, its technique, its dangers, or its results. While the subject is not strictly one of operative surgery yet it is a mechanical form of treatment, requiring asepsis or antisepsis and a certain delicacy in technique possessed by surgeons.

The creation of a closed ARTIFICIAL PNEUMOTHORAX was first proposed by Forlanini, of Pavia, in 1882, but it was not until 1888 that he himself attempted the procedure in a case of unilateral phthisis with pleuritic effusion. In 1894, he published the results of his first 2 cases of artificial pneumothorax, but neither in Italy nor elsewhere was much notice taken of his work. In 1898, J. B. Murphy, of Chicago, presented an account of his attempts at influencing pulmonary tuberculosis by artificial pneumothorax and the following year Lemke, an assistant of Murphy's, reported 53 cases of pulmonary tuberculosis treated with intrapleural injections of nitrogen. In the majority of cases the result was a considerable improvement, and there was only one severe accident, a right-sided hemiplegia with motor aphasia evidently caused by gas embolism. There have been some suggestions recently that James Carson, of Liverpool, first conceived the possibility of using pneumothorax as a therapeutic measure in 1819, but Carson never attempted to induce pneumothorax, although Cayley, in 1885, attempted to obtain a pneumothorax by introducing an elastic catheter through an incision in the sixth intercostal space and leaving it *in situ*. Potain, in 1888, reported that he had injected sterilized air into the pleural cavity in 3 cases of spontaneous pneumothorax with liquid effusion after evacuating the fluid. His therapeutic results were remarkably good, but were accepted with utter indifference by his colleagues. In 1905, Brauer, of Marburg, reported his first case of artificial pneumothorax and described his technique, which was copied after that of Murphy, with great care. Although Forlanini then claimed the right of priority and gave an account of 25 cases of pulmonary tuberculosis treated by artificial pneumothorax, yet the tremendous wave of investigation and enthusiasm for this method was stimulated by the publications of Brauer and his pupils. In 1911, Robinson and Floyd reported their series of 27 cases. In the same year Mary E. Lapham published her report, and the method had returned to this country for trial by hundreds of investigators.

The literature on the subject is now tremendous, and it would not be possible to list all of the articles published even during the past year alone. I am especially indebted to the monograph on *Surgery of the Lung* by Garré and Quincke,<sup>1</sup> and to the papers of Balbomi;<sup>2</sup> Rist;<sup>3</sup>

<sup>1</sup> Wm. Wood & Co., 1913.

<sup>2</sup> Boston Medical and Surgical Journal, 1913, vol. clxvii, p. 755.

<sup>3</sup> Quarterly Journal of Medicine, 1912-1913, vol. vi, p. 259.

Hamman and Sloan;<sup>1</sup> Taussig;<sup>2</sup> King and Mills;<sup>3</sup> Floyd<sup>1</sup> and Zink.<sup>5</sup> All of these papers contain reviews, and overlap to some extent. In the latest of the *Murphy Clinics* (December, 1913), Dr. Murphy has contributed an article of 35 pages with a discussion of technique and other details.

No one has yet gathered up the scattered reports of the clinical results to such an extent as to be able to state definitely the indications or contra-indications for pneumothorax. I would emphasize, however, that those who have had no experience with the method should be exceedingly cautious at first and should only attempt to treat those cases in which the majority of writers agree that a certain indication exists. Perhaps it would be better to indicate first the contra-indications to attempting the production of artificial pneumothorax.

*Contra-indications.* 1. Extensive solid pleural adhesions on the side to be operated on. This condition cannot always be made out in advance; but, as will be shown later, will frequently necessitate abandoning the procedure.

2. Early acute lesions, because of the tendency to bilateral involvement and because such cases may be cured by other methods of treatment without the risk of the nitrogen injection.

3. Acute miliary tuberculosis.

4. Extensive involvement of the healthier side. At first the indication was laid down that the disease should be distinctly unilateral, but Forlanini, Brauer, Saugman, and other authors are not too insistent on this point, for a slight affection in the opposite lung is often very fortunately influenced by the pneumothorax; but, on the other hand, torpid lesions in the so-called healthy lung may be activated.

5. Serious disease, tuberculous or otherwise, of the organs of the body. This is especially true of intestinal tuberculosis, of persistent or chronic nephritis, or amyloid degeneration of the kidneys. Forlanini has, however, seen favorable results in cases in which chronic nephritis was present. He excludes acute tuberculous hepatizations and caseous pneumonias, but Brauer and Saugman and Rist have had good results in such cases. Tuberculosis of the larynx is not a contra-indication, because the pneumothorax causes a cessation of sputum production which assists in the healing of the larynx.

6. Myocardial Disease. The condition of the heart should be such as to be able to care for a readjusted pulmonary circulation and should be strong enough not to readily dilate when pleural shock occurs.

7. Emphysema and splanchnoptosis are considered contra-indications by Balboni.

<sup>1</sup> Bulletin of the Johns Hopkins Hospital, 1913, vol. xxiv, p. 53.

<sup>2</sup> Interstate Medical Journal, 1913, vol. xx, p. 665.

<sup>3</sup> American Journal of the Medical Sciences, 1913, vol. cxlvi, p. 330.

<sup>4</sup> Boston Medical and Surgical Journal, 1913, vol. clxix, p. 713.

<sup>5</sup> Beit. z. Klinik d. Tuberk., 1913, vol. xxviii, p. 155.

*Indications.* The ideal indication is a moderately severe or an advanced unilateral disease with only slight adhesions or no adhesions on the affected side; the other side should be free, or almost free, from disease. In such cases, we are most justified in looking for a complete symptomatic cure. But it is not necessary, as has been stated, to have a unilateral lesion. There are many cases on record of advanced tuberculosis of one lung with a slight involvement of the other in which an artificial pneumothorax was followed by an apparently complete recovery of the slightly involved lung. There are also a few cases on record in which good results have been observed even when the second lung was in an advanced stage of tuberculous disease. Among the 102 cases reported by Brauer and Spengler,<sup>1</sup> many of the good results were in bilateral cases. Much depends upon the location of the disease in the opposite lung. When the active process is confined to the apex, improvement may be expected, but a basal process in the least affected side nearly always precludes the use of nitrogen compression. Recurrent hemoptysis is markedly benefited, and the presence of fever, cough, etc., is not a contra-indication. Balboni groups the indications in the following manner:

1. Unilateral cases, a constant indication.

2. Advanced bilateral cases; treatment may be attempted because the patient has everything to gain and nothing to lose. At any rate, a symptomatic relief is obtained which in the phthisical represents a benefit to the patient, and, in those cases in which the lesion in the other lung is primary and circumscribed, recovery may be possible.

3. Extrathoracic tuberculosis, such as laryngeal and intestinal tuberculosis, are not in themselves contra-indications, which opinion in regard to intestinal tuberculosis is not in accord with the majority of authorities.

4. Pleural adhesions. Balboni believes that it is possible to inject gas in various places forming multiple sacs and compressing the lung. I believe this represents the height of enthusiasm and is not to be commended.

5. Hemoptysis. Always an indication.

6. Disease other than phthisis. Treatment may be attempted in bronchiectasis and lung abscess. Rist also mentions chronic pneumonia and Wenckebach (quoted by Taussig) noticed the favorable influence on a chronic tuberculous empyema by the formation of a pyopneumothorax.

7. Incipient cases. Balboni states that in one case the result has justified the treatment, but this does not agree with the opinion of others. Like all methods of topical treatment which have obtained excellent results in a certain number of cases, enthusiasts are bound

<sup>1</sup> Beitr. z. Klinik d. Tuberkulose, 1911, vol. xix, p. 1.



to claim too much for the method and to recommend it as a "cure-all" for many varieties of disease.

A conservative opinion is expressed by Leuret,<sup>1</sup> who states that he has recently been systematically examining all of his patients with pulmonary tuberculosis and among the last 86 found only twelve in which there was any possibility of applying the technique, and, in the 12, favorable conditions were encountered in only 3. Kuhn,<sup>2</sup> who has long advocated systematic exercises of the lung with the aid of the aspiration mask, believes that induced pneumothorax has a field in extensive processes, especially those with a cavity, and in those cases in which the temperature cannot be kept normal under repose or slight exercise.

*Technique.* The production of an artificial pneumothorax consists in the introduction into the pleural cavity of a gas in sufficient quantities to produce a collapse of the diseased lung and which will remain unabsorbed for a sufficient time to enable the collapse to be more or less permanent. Air and oxygen are absorbed so rapidly as to render them useless for this purpose; salt solution, sterile oils, and other fluids have been tried but give rise to severe local or general reactions. Nitrogen gas is the substance universally used for the purpose, and may be obtained most conveniently in tanks from dealers or may be made artificially by the action of potassium hydrate and pyrogallie acid on atmospheric air. Even nitrogen is slowly absorbed from the pleural surfaces. Hamman and Sloan note that from 80 to 100 c.c. are absorbed per day following the first injection, but that after the pneumothorax has existed for some months, only about 25 to 50 c.c. per day are absorbed.

As regards the best manner of performing the first injection, clinicians are divided into two schools: those who follow the method of Forlanini and those who follow the Murphy-Brauer method. An elaborate discussion of these techniques is given in the article by Rist, but space prevents more than a brief mention of the two methods. In either method it is necessary to have (1) a special form of aspirating needle, of which a number of models exist; the one devised by Floyd may be highly recommended; (2) an apparatus consisting of two glass receptacles, one of which contains the nitrogen gas and the other contains water; they are connected by rubber tubing. By raising the water bottle, the gas is slowly forced into the pleural cavity as it is replaced by the water. (3) A manometer. We owe this improvement in the technique to Brauer and the simple addition of the manometer has transformed a blind and daring operation into a perfectly controllable, appropriate, and scientific technique. A simple U-shaped glass manometer for water is the one in most common use, and it cannot be emphasized.

<sup>1</sup> Archiv Gén. de Méd., 1913, vol. xcii, p. 209.

<sup>2</sup> Beit. z. Klin. d. Tuberk., 1913, vol. xxvii.

too strongly that no attempt whatever should be made to inject nitrogen unless the manometer is in perfect working order to indicate the oscillations of pressure. The apparatus devised by Robinson and shown in the accompanying illustration (Fig. 14) has been found to give perfect satisfaction, although I would prefer to have the openings for the water circuit below.

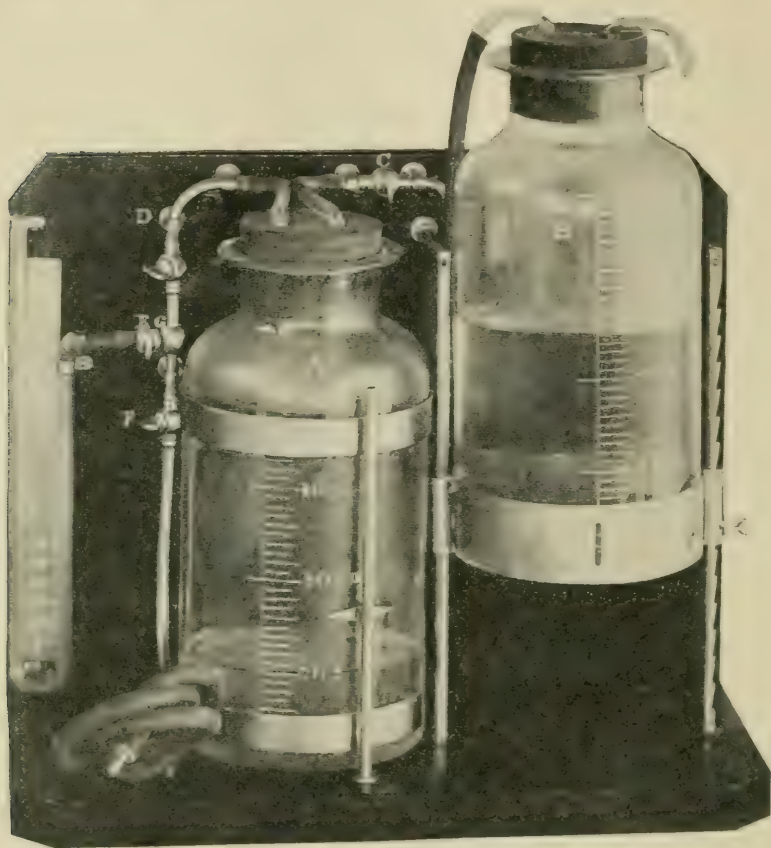


FIG. 14.—Robinson's artificial pneumothorax apparatus.

*The Forlanini Methods* While the simple puncture method originated with Forlanini, yet the modern procedure entirely differs from the original description. Nervous patients may be given a small dose of morphine. The patient is then placed upon the side opposite to that which is to be injected, with a pillow beneath to effect greater separation of the ribs. The skin should be sterilized by painting with tincture of iodine. By means of a hypodermic syringe local anesthesia is produced by the injection of 1 or 2 per cent. solution of novocain; the muscle should also be injected. The sterilized cannula is connected with the water manometer by sterile tubing, and the connection with

the nitrogen bottle closed. The skin is then punctured with a small knife, and the trocar and cannula slowly pushed toward the pleura. Shortly after passing through the skin, the dense external intercostal muscle and aponeurosis is encountered, and a little farther the pleura will be entered. The sensation to the guiding hand is very similar to that experienced in tapping the spinal canal. When the pleura is thought to have been entered, the trocar is withdrawn and immediately the water column *on the negative side* should rise a few cm. (3 to 12) and to oscillate rhythmically coincident with the respiratory movements. The communication with the nitrogen cylinder is then opened, and, by raising the water bottle, the gas is slowly forced into the pleural cavity at the rate of 50 c.c. per minute, until about 1000 c.c. at the maximum positive pressure of 12 cm. of water has been introduced; usually from 600 to 800 c.c. are introduced. During the introduction the patient may complain of some distress and tenseness, especially over the anterior portion of the lower chest. The presence of much pain indicates adhesions. If the pain and distress are intense, the needle should be removed and the operation abandoned.

A modification in the technique has been introduced by Deneke and others, whereby they first inject oxygen until the oscillation of the manometer shows that the pleural cavity has been reached. If by chance, a vessel has been entered, the introduction of a small amount of oxygen is not so liable to produce fatal pulmonary embolus. The use of oxygen, however, unnecessarily cumbers the technique, and the operator should learn to enter the pleura with the needle.

*The Brauer Method.* Under local anesthesia and with every aseptic precaution, an incision of from 5 to 7 cm. is made in the intercostal space; the dissection is continued to the parietal pleura with particular care as to hemostasis. The pleura is then perforated by means of a blunt cannula with a lateral opening, and, if conditions seem favorable, is connected by a sterile rubber tube with the manometer and the nitrogen gas apparatus, and the gas allowed to enter the pleural cavity as in the other method. After a sufficient quantity has been introduced, the cannula is withdrawn, the intercostal muscles are sewed with catgut, and the skin sutured as usual.

*Further Injections.* Reinjections necessarily depend upon various circumstances. At the first introduction, as has been said, about 600 to 800 c.c. have been given. The collapse of the lung is not complete after the first injection and the amount of pneumothorax should be determined by a Röntgen examination of the chest. After the second injection, a slight positive pressure should be obtained on the manometer, about 2 to 4 cm. of water being sufficient to keep the lung perfectly compressed when there are no pleural adhesions. Subsequent injections should be given at first about twice a week, then every week, and then every few weeks, depending upon the findings by the Röntgen



rays. When there are no diaphragmatic adhesions, Kienboeck's phenomenon (inspiratory elevation of the diaphragm on the side of the pneumothorax) indicates a positive intrapleural pressure. When this phenomenon is absent, it means that the pressure in the pleural space is no longer positive, and that nitrogen must be injected again. After the collapse of the lung is accomplished, the intervals between treatment are governed not only by the Röntgen ray but also by the amount and character of the sputum, fever, etc. Finally, treatment should be continued for years, if necessary, and Balboni makes the pertinent suggestion that in private practice two or more physicians should take charge of the treatment so that in case one is obliged to give it up, the other can continue it.

*The Action of Pneumothorax.* Both in animals and in man the condition of the lungs has been studied following the institution of a pneumothorax. As a result of the compression, the lung mechanically immobilizes, and the circulation diminishes therein; an overproduction of fibrous tissue, especially around the bloodvessels and bronchi, occurs, pneumonic foci and old isolated tubercles become cicatrized, and the caseous masses disappear, partly by expulsion through the bronchi and partly by compression by the connective-tissue proliferation. Brauer suggests that the curative process is probably dependent on a lymph stasis. Certain degenerative changes are seen in the alveoli, bronchioles and bronchi, but it is difficult to determine whether this is limited to previous diseased structures or whether it is more or less generalized; no fresh tubercles are ever found in the compressed lung, a point confirmed by all necropsy records.

It would serve no purpose to discuss in detail the theoretical explanation of the therapeutic effects of pneumothorax. There is conflicting evidence showing that the lung is hyperemic or is anemic. Brauer considers that lymph stasis due to immobilization of the lung is a more important factor than the circulatory changes. Forlanini believes that complete immobilization of the lung arrests the tuberculous process by impeding the ischemia due to respiratory movements. I agree with Rist that the explanation originally outlined by Murphy is more satisfactory than any of the others. It is simply this: Artificial pneumothorax enable us to treat tuberculosis of the lung just as we treat tuberculosis of the joints by immobilizing and enforcing physiological rest, by enforcing drainage of the secondary products through the bronchi, and by bringing the walls of the ulcer together and allowing the ulcer or cavity to heal. Pneumothorax does not cure the disease; it creates nothing; it has no positive influence over the virulence or vitality of the tubercle bacillus, we simply endeavor to produce a collapse and an immobilization of the lung as simply and as effectually as possible.

*Accidents and Complications.* 1. Pleural Reflexes. Many writers refer to this complication, and Forlanini especially refers to its fre-

quency. Delirium, loss of consciousness, convulsions, paralysis of the limbs, rapid and irregular action of the heart and lungs, cyanosis, etc., have occurred and may last a few hours, a few weeks, or suddenly terminate fatally. Brauer and others, while not denying the possibility of a pleural reflex, believe that it must be very rare, and that most of the reported instances were cases of gas embolism. Peterson<sup>1</sup> reports a death with all the signs present of a pleural reflex. The necropsy findings indicated that the trouble was due to injury of some vessel by the puncture needle. A number of cases are on record, however, in which syncope has been coincident with pleural pain. Robinson and Floyd<sup>2</sup> believe that novocain anesthesia of the pleural membrane obviates the risk of this complication, but Floyd<sup>3</sup> in his later paper states that he has had one experience with a fatal result.

2. Gas Embolus. Forlanini, in 1912, reported on 134 patients with two deaths from this cause; Saugman, in 1913, with an experience of 5000 operations on 186 patients, had seen two fatal cases at the first injection. Brauer and Spengler mention 4 deaths, and there are a number of others in the literature, Sundberg,<sup>4</sup> Jessen,<sup>5</sup> Zink,<sup>6</sup> and others having reported deaths from this cause last year. Sundberg states that B. Hausen collected from the literature 31 instances of serious symptoms, with a fatal termination in 8 cases. Most of the cases reported have occurred during or after a refilling, and the complication is not, therefore, a good argument against the puncture method. The accident ought rarely to occur if the gas is not introduced until respiratory oscillations have been obtained on the manometer. Only then can the operator be sure of having entered the pleural cavity. Brauer maintains that gas embolism may occur without the introduction of gas through the needle, provided it has wounded a bloodvessel in the lung, but this seems improbable. Jessen,<sup>7</sup> however, insists on the possibility, and collects several cases.

3. Emphysema. This commonly occurs, and its presence is troublesome but not serious unless it perforates the costal pleura and invades the mediastinum. Attention to the technique with metriculous care in the handling of the needle while injecting will prevent the frequent occurrence of this complication. Careful suturing after the incision method and compression at the site of puncture or incision are necessary adjuncts to the technique. Lillingston<sup>8</sup> writes interestingly of these complications, particularly embolus, and Balboni reports 4 cases in which pressure symptoms resulted from emphysema.

<sup>1</sup> Mitt. aus d. Grenzgeb. d. Med. u. Chir., 1913, vol. xxvi, S. 834.

<sup>2</sup> Archiv of Int. Med., 1912, vol ix, p. 452.

<sup>3</sup> Loc cit.

<sup>4</sup> Beit. z. Klin. d. Tuberk., 1913, vol. xxvi.

<sup>5</sup> Deutsch. med. Woch., 1913, vol. xxxix, No. 26.

<sup>6</sup> Berlin. klin. Woch., 1913, vol. I, No. 2.

<sup>7</sup> Deutsch. med. Woch., 1913, vol. xxxix, No. 26.

<sup>8</sup> Lancet, 1913, vol. ii, p. 796.

4. Pleural Effusion. According to Floyd, this is the most common complication, and comes on after several injections; it is mentioned by almost all writers. Weiss<sup>1</sup> estimates that it is met with in about 50 per cent. of cases. They are variable in size, character, and the symptoms produced, transformation into empyema being quite exceptional. Montgomery<sup>2</sup> noted 2 instances in 7 injections by Speese at the Phipps Institute in Philadelphia, in which succussion splash was present in all cases. The origin of these serous exudates has been the cause of much discussion; high intrapleural pressure, stretching and rupture of adhesions, infection and tuberculous pleuritis having all mentioned. They assist in the compression of the lung and if not too great should not be tapped.

5. Displacement of the mediastinum or heart. This is a rare occurrence and easily treated by withdrawing some of the gas.

6. Activation of the lesion in the opposite lung, pain, digestive disturbances, etc., are also occasionally met. Pain is usually due to the stretching of adhesions.

*Results.* Statistics on the results of treatment with pneumothorax are of little value because the condition of the individual patient will vary so widely. As in every case of advanced pulmonary tuberculosis, a cure is never attained in the actual meaning of the word, but in its practical sense there is attained a prolongation of life. How long the individual would have lived without the operation is a matter for the judgment of the operator to decide.

For this reason, Forlanini<sup>3</sup> declines to tabulate his 103 cases statistically, preferring to state that, on the whole, artificial pneumothorax is a satisfactory treatment, and that it results in a considerable number of triumphant recoveries in cases of advanced tuberculosis, formerly considered hopeless. Nearly 1000 cases of artificial pneumothorax have been reported with a symptomatic cure of 40 per cent. In 1911, Brauer and Spengler<sup>4</sup> published the complete history of 102 cases treated by them during the five foregoing years. Fifteen of these patients were studied because it was believed that clinical recovery had been achieved through compression, and they had gone nine months after the pneumothorax had been ended. They were all severe cases with fever and with abundant bacilli in the sputum, and, in eight, there was evidence of a cavity. Spengler recorded that they were all without fever, without expectoration and fully able to work, and, in 12, the sputum was found free from bacilli. Further reports of statistics would serve no purpose; during the past year Balboni (21 cases), Hamman and Sloan (20 cases), King and Mills (16 cases) have reported series of cases. Zink<sup>5</sup> writes

<sup>1</sup> *Beit. z. Klin. der Tuberk.*, 1912, vol. xxiv, p. 333.

<sup>2</sup> *Journal of the American Medical Association*, 1913, vol. lx, p. 494.

<sup>3</sup> *Ergebn. der inn. Med.*, 1912, Bd. lx, S. 621.

<sup>4</sup> *Beit. z. Klin. d. Tuberkulose*, 1911, vol. xix, p. 1.

<sup>5</sup> *Loc. cit.*



from the Basel Sanatorium at Davos describing his experience with artificial pneumothorax in 110 cases. He was able to accomplish the purpose of an effectual pneumothorax in 81 patients; in 35, the lung was completely compressed, and, in 46, adhesions interfered to some extent. He tabulates the details and gives diagrams of his cases. Amrein and Lichtenhahn<sup>1</sup> report 11 cases in detail, and in a footnote state that they have since treated 11 other cases. It is interesting to note that in the first series they used the incision method, and in the last series have been using the puncture method. A number of other reports in the foreign literature mostly refer to a few cases, and are not especially interesting or important.

It would seem, therefore, that we have in induced pneumothorax a method of treatment which offers a prospect of temporary and sometimes permanent relief after the usual methods of treatment have been unsuccessfully tried. If one follows the indications strictly, there will be only a relatively small number of these afflicted that are especially suitable for this method of treatment. If the operator confines himself to the strictly unilateral cases, he will be gratified by a 40 to 50 per cent. temporary or permanent improvement; but if, on the other hand, he injects all cases in which satisfactory compression can be obtained, he will be disappointed in his results. The procedure is of great value in the treatment of pulmonary hemorrhage, of real aid in the chronically recurring tubercular pleural effusion, and in some cases of bronchiectasis and pulmonary abscess in which the inflammatory conditions are not too extensive.

In the words of Floyd, the treatment is most applicable when the patient is under the supervision of hospital or sanatorium management, and has failed to do well with the older and well-established methods of treatment.

I have mentioned the use of induced pneumothorax in the treatment of hemoptysis. It is interesting to quote the following from Murphy<sup>2</sup> about the immediate management of pulmonary hemorrhage. He first states that one should determine the side and the particular lung from which the hemorrhage is occurring. He then advises the following technique: "Take an ordinary hypodermic needle, rub the sharp point dull on a brick, cover the butt end of the needle with cotton, which will serve as a filter of the air that is to enter, then insert the needle into the pleura at the point of election for the production of the pneumothorax. The skin should have been prepared previously by painting it with iodine and puncturing it with a tenotome, as is our custom. The idea now is to let the air enter the pleural cavity through the needle, the cotton filtering it as it enters, thus producing a pneumothorax. The finger placed over the butt end of the needle serves as a valve. As the patient inspires, the finger is lifted off the needle to allow the air

<sup>1</sup> Quarterly Journal of Medicine, 1913, vol. vi, p. 487.

<sup>2</sup> Surgical Clinics, 1913, vol. ii, p. 938.

to enter, and on expiration the opening is closed with the finger. In that manner one can pump the pleural cavity full of air or to any desired degree of compression. If the patient becomes too cyanotic, or if the breathing is embarrassed, lift the finger from the needle and allow a little air to escape. The procedure is now reversed. Close the end of the needle with the finger on inspiration, and remove the finger on expiration, so that the air will be pumped out instead of in. It is a very simple but exceptionally valuable procedure for the treatment of pulmonary hemorrhage. The instruments necessary are always at hand. The method can be instituted quickly, so that there will be no time lost. All one needs is a blunt needle, a little cotton, and, at the most, some ice to freeze the skin, but even this is unnecessary, because when speed of operation is necessary, local anesthesia need not be resorted to in any of these cases."

**Major Operative Methods.** A reference to the table prepared by Ewart<sup>1</sup> will show that a large variety of surgical procedures have been tried in the treatment of pulmonary tuberculosis. I will refer briefly to most of them and omit some entirely. I am especially indebted to the monograph on the *Surgery of the Lung* by Garré and Quincke<sup>1</sup> for much of the following information. The work of Brauer, Spengler, Friedrich, Sauerbruch, and Wilms stands out preëminently in the development of this subject. Most of these operations are thoracoplasties, attempted in order to obtain a collapse of the chest wall and subsequently a compression of the lung in cases in which extensive adhesive formation have prevented the performance of an induced pneumothorax with nitrogen. The following table, from Garré and Quincke, illustrates the essential points distinguishing the two methods of treatment:

	Artificial pneumothorax.	Resection of ribs and thoracoplasty.
Condition of the pleural surfaces.	Pleural surfaces free.	Pleural surface adherent.
The general condition of the patient.	Can be employed in cases of bodily weakness.	State of nutrition and strength must be fairly good.
Severity of operation.	Slight.	Not inconsiderable.
Length of treatment.	At first at the most a few weeks in the sanatorium, then one to two years' out-patient treatment.	A few weeks or months in hospital.
Immediate effect upon the lung.	Total collapse, immobilization.	Only slight retraction; respiratory movements only less free.
Secondary effect on the lung.	After cessation of pneumothorax, the healthy parts of lung become expanded again and can perform their function.	The reduction attained in the volume of the lung remains permanent.
Effect on the disease portions of the lung when there are partial adhesions.	Uncertain and limited.	The effect can often be satisfactorily localized.

<sup>1</sup> PROGRESSIVE MEDICINE, 1913, vol. xv, p. 24.

<sup>2</sup> Wm. Wood & Co., 1913.

The technique of thoracoplasty is not yet on any settled basis; the subject is too new, all of the important papers dating back only a few years. The most elaborate operation is that of Friedrich, in which the second to the tenth ribs are removed subperiosteally from the angle to the sternal margin. This requires a large incision, and is rather shocking to a patient already devitalized by an advanced tuberculous process. It is performed in a way similar to the Schede operation, except that the pleural cavity is not opened. A number of deaths have been reported, supposed to be due to the immediate collapse of the lung with displacement of the mediastinum. As a consequence, Friedrich, in his recent papers, advises the operation only in the presence of a rigid mediastinum, only in patients between fifteen and thirty-five, and only in those who are not anemic or who have not fresh metastases to other organs. Sauerbruck operates in two stages: he first resects the fourth to the eighth ribs, and then, after some weeks or months, he resects the first to the fourth ribs. The lower portion must always be done first, because otherwise there is a risk of the secretion of the collapsed part of the apex producing an aspiration pneumonia in the lower lobe. He reports 24 patients, with one death as a result of the operation, and two secondary deaths from pneumonia after nine months. There were two cures, two improvements almost amounting to cures, 4 considerably improved, 7 somewhat improved and 2 cases not affected. Four patients are still under treatment (1912). In his latest paper,<sup>1</sup> he emphasized that compressive operations on the lung promises benefit only when the lung process has already shown a tendency to shrivel. Wilms<sup>2</sup> advocates a simpler operation, and one that has much merit to it. Under local anesthesia, a hook-shaped incision is made from above downward, beginning at the second costovertebral angle. Ribs are exposed, and divided in successive amounts. At a second session, about three weeks later, the costal cartilages are divided at the sternum. In some cases he has made three transverse incisions instead of the linear one, the first at the level of the third rib, the second on the fifth, and the third on the seventh rib.

COMPRESSION OF THE LUNG BY THE USE OF FILLING. Some work has been done recently on an unusual method of pneumolysis. Baer<sup>3</sup> detaches the pleura from the ribs and fits a paraffin filling into the extrapleural space thus made. An incision is made between the ribs over the lung cavity, the pleura separated from the fascia and the mass of paraffin injected or fitted into the extrapleural space and the skin sutured at once. One patient died from tuberculous meningitis seven weeks afterward and the cavities in the lung were found entirely obliterated, the filling healing without infiltration. Jessen, in the same journal,

<sup>1</sup> Münch. med. Woch., 1913, vol. lx, p. 625.

<sup>2</sup> Therapie d. Gegenwart, 1913, vol. liv, No. 1.

<sup>3</sup> Münch. med. Woch., 1913, vol. lx, p. 1587.



reports similar experiences with a filling of wax, vaseline, magnesium carbonate, and salicylic acid. A portion of the rib is resected and the finger worked between the periosteum and the endothoracic fascia. The filling is then injected. Sauerbruch also has used a filling when the thoracoplastic operation could not be rendered complete.

**PHRENICOTOMY.** It has long been known that, in cases of unilateral paralysis of the diaphragm, the affected portion moves upward until it reaches the position of extreme expiration and thereafter remains remarkably motionless. The abdominal viscera following the diaphragm exercise a compressing effect upon the lung nearly as complete as in cases of artificial pneumothorax. This phenomena led Sturtz to suggest section of one phrenic nerve in cases in which a thoracoplasty would otherwise be considered, and in one case of bronchiectasis operated upon by Bardenhauer a satisfactory outcome was obtained. Sauerbruch,<sup>1</sup> stimulated by the work of Scheppelman, has done a phrenicotomy in five cases, two without and three with a partial thoracoplasty. All five patients have shown definite improvement, although the interval since the performance of the operation is too short to permit any final judgment. He believes that the chief value of the operation in pulmonary tuberculosis will be that it will allow a partial, instead of a complete, thoracotomy with the same ultimate effect in the diseased side. He locates the phrenic nerve by an incision four inches in length along the posterior border of the sternocleidomastoid muscle. The nerve is easily found lying in the scalenus anticus muscle.

*Ligation of the Pulmonary Arteries.* In 1911, Sauerbruch and Bruns did some experimental work in animals and found that in two or three months the lobe became contracted and adherent to the thoracic wall. The operation has been performed in human beings in two cases of bronchiectasis. Sauerbruch reported these cases before the Third International Congress at Brussels, and the patients were much improved at that time by the operation.

Ligation must be followed by thoracoplasty, so that the thoracic wall can follow the traction of the contracting lung. Meyer<sup>2</sup> reports three cases in which this method was used, with improvement in all. He states, in regard to the technique of operation, that it is not as simple in the human being as it is in the dog. In man, the lobes of the lung often form a unit, with adhesions between them. The interlobar space can be entered, but the bronchus, with its vessels, is not always reached without injury to the lung tissue, and even when thoroughly exposed, as in the third case of his series, the bronchus may be found covered by a few large inflamed lymph nodes which render isolation of the artery in the depth difficult, if not impossible. In addition, there are so many variations in the division of the pulmonary artery as to leave

<sup>1</sup> Münch. med. Woch., 1913, vol. lx, p. 625.

<sup>2</sup> Annals of Surgery, 1913, vol. lviii, p. 197.

the surgeon in doubt as to whether all the vessels that should be tied have been tied.

For these reasons, Meyer has done some experimental work in the endeavor to reach the right and left arteries before their division into branches, viz., near the heart. He has evolved the following procedure: Right intercostal incision in the fourth space; incision of the pericardium (low down, to avoid hemorrhage), splitting of the pericardium upward until the ascending aorta and superior vena cava are properly exposed. If these two vessels are then gently separated with blunt retractors or the fingers without compression, and the right auricle held down with a small gauze mop to control its fibrillation, the transversely running right pulmonary artery becomes clearly visible in the depth, and can be surrounded with a ligature. A little peripherally the right pulmonary artery divides into a superior and inferior branch which might be reached either from within the pericardium by pulling the main trunk, gently forward and toward the median line, retracting at the same time the superior vena cava outward, or outside of the pericardium through an incision of the pleura right above the vena azygos.

On the left side, the pulmonary artery can be reached easily by Trendelenburg's incision, which consists of a horizontal incision about four inches long on the left second rib beginning at the left border of the sternum. This meets a perpendicular incision extending from the sternoclavicular articulation to the third rib.

Tiegel, in 1911, compressed the pulmonary veins of animals with silver wire; he obtained a fibrous thickening in the lung and pleura.

**Carcinoma of the Esophagus.** Operative interference in carcinoma of the esophagus, particularly of the thoracic portion, has been so beset with difficulties and discouragements that it is a wonder that any surgeon persists in trying to make improvements in the technique of the surgery of this organ. As Meyer well says, it requires gradual personal training to get over the extreme and bitter disappointment one feels on seeing a patient pass away, sooner or later, after a difficult operation that had taxed to the utmost the physical and mental endurance of everyone concerned in the operation. Meyer believes that, in spite of the ill success of the past, we should continue to attack cancer of the esophagus in all portions of the tube and not to limit ourselves, as some have done, to the lower third of the esophagus. There is always a reason for the failure of surgery to accomplish results, either the case was not one suitable for operation, or the technique was not properly adapted to the individual case, or the theory was wrong and we need to start over with a new technique. Meyer,<sup>1</sup> in a paper just issued last year, states that the reasons for the failures that have thus far attended esophageal surgery are:

<sup>1</sup> Surgery, Gynecology, and Obstetrics, 1912, vol. xv, p. 639.

"1. The general condition of the patients. By the time they reach the surgeon it has become too much reduced.

"2. The spread of the disease. The local growth has trespassed the borderlines of the organ in which it started, involving the vital organs in its immediate neighborhood, the pneumogastric and sympathetic nerves, the aorta, or lung.

"3. The magnitude of the operation.

"4. The extreme thinness of the wall of the esophagus in man." The disease may be discussed under four headings:

1. THE DIAGNOSIS. It is absolutely necessary for success to make the diagnosis of cancer of the esophagus at an early stage when the strength of the patient is still sufficient to carry him through the effects of the severe operation, and when the disease is mostly confined to the esophagus. Just as in every other cancer, metastasis is almost impossible to remove surgically; and, in addition, the esophagus presents the problem whereby extension of the disease involves the pneumogastric nerves; the case must be operated on at a time when these can be dissected off. Meyer<sup>1</sup> divides the disease into three stages of development. In the first stage, it is simply a growth or ulcer in the wall of the esophagus infiltrating the submucous and muscular coats. Symptoms of stricture are absent, but there may be difficulty in swallowing, and, on account of change of food, loss of weight. As soon as the growth has encircled the esophagus, the second stage has been entered upon, and the difficulty on swallowing becomes more pronounced. The third stage sets in with the reaching out of the growth upon the walls of the tube, and the adhesion to neighboring organs and structures. The disease should be treated during the first stage, and an effort should be made to bring before the profession the early symptoms and the methods of diagnosis of a suspected early carcinoma of the esophagus. After having obtained a history indicating the possibility of some obstruction in the esophagus, the existence or non-existence of such obstruction should be demonstrated by means of sounds, radiography, esophagoscopy, or even by exploratory thoracotomy. Meyer is rather enthusiastic over the use of sounds because they can be made use of by every physician, but I am of the opinion that esophagoscopy is a far better method of procedure because it not only enables one to see the growth, but to remove a small piece for microscopic examination. To attempt the latter requires skill in the use of the instruments, and can only be done by experts. The point taken by Meyer is that a patient complaining of difficulty in swallowing should be considered a serious case, and carcinoma suspected.

Recently, Bassler<sup>2</sup> has offered a contribution to the Röntgen diagnosis

<sup>1</sup> Medical Record, 1913, vol. lxxxii, p. 888, and Surg., Gynec., and Obst., 1913, vol. xvii, p. 693.

<sup>2</sup> Journal of the American Medical Association, 1913, vol. lx, p. 1283.



of early cancer of the esophagus which seems of real value. He uses a four-foot piece of rubber tubing 4 mm. in diameter, to one end of which is attached a small rubber bag having a brass tip at its lower end to give it weight. At the upper end of the tube is a cock, and beyond this is attached an ordinary glass syringe of about 60 c.c. capacity. The bag and tube are given to the patient and swallowed until the bag is in the stomach, after which it is filled with water by means of the syringe, the cock closed, and the tube pulled on so that the bag plugs the cardiac orifice of the stomach. The patient is then told to exhale completely so as to raise the dome of the diaphragm to a high level and the external tube is held tightly at this point. It is then fastened about the forehead of the patient, around his neck or by means of an external weight. A mixture of bismuth, acacia, and water is run into the gullet from an irrigating jar by means of an ordinary ureteral catheter, about 150 c.c. being required before the bismuth mixture appears in the mouth. With the patient standing, the radiographs are then taken in the lateral dorsal position with the left back to the plate. These plates may be stereoscoped. The relaxation of tension on the tube permits the bismuth mixture to flow into the stomach; the cock is then opened and the water siphoned out of the bag, after which the tube is easily withdrawn.

2. PNEUMOTHORAX. The fear of pneumothorax has been completely obliterated by the introduction of the various forms of differential pressure apparatus. In Torek's successful case, the anesthesia was given by intratracheal insufflation according to Meltzer-Auer, the apparatus constructed by Dr. Fischer being used. Torek observes that the employment of a differential pressure chamber, either positive or negative could not be considered, as the rubber cuff around the patient's neck used in such an apparatus would have interfered with the operation at the neck. Meyer, in his report in 1912, used the positive pressure cabinet in his first 2 cases, and the negative chamber in the latter two.

3. INFECTION. In spite of the most careful asepsis, infection of the pleural cavity has destroyed a number of patients operated upon for cancer of the esophagus. Not only is the infection liable to be introduced at the time of operation, but the thin-walled esophagus may easily allow air carrying infection to penetrate the suture line. A number of attempts have been made to overcome the postoperative acute pneumothorax and yet, at the same time, to furnish drainage to the pleural cavity. Wendel<sup>1</sup> split the diaphragm, in a case of cancer of the cardia, and sutured it to the esophagus so as to place the field of operation intra-abdominally so that drainage could be accomplished through the abdomen. Tiegel<sup>2</sup> uses a flexible metal drainage tube with a rubber valve. Janeway and Greene and Meyer advocate drainage of the pleural cavity, and propose leaving the patient under differential

<sup>1</sup> Archiv. f. Chir., 1910, vol. xciii, p. 311.

<sup>2</sup> Zentralbl. f. Chir., 1911, No. 10.

pressure for some time, at least forty-eight hours after operation. No drainage was used in Torek's case. He came to the conclusion that the rational way to deal with the danger of leakage from the upper stump of the esophagus was to eliminate that organ from the pleural cavity altogether.

4. TECHNICAL DIFFICULTIES. Most surgeons exclude cancer of the esophagus from the realm of operative interference (1) because of the inaccessibility of that portion of the esophagus which passes underneath the arch of the aorta; (2) the danger of injuring the pneumogastric nerves which in that location are placed like a plexus in front of the esophagus; (3) the difficulties of effecting closure of the stump of the esophagus; and (4) the impossibility of bringing the divided ends of the esophagus together after resecting more than a few inches, requiring extensive maneuvering to effect a juncture between the mouth and the stomach.

In regard to the method of approach, Meyer, in discussing the relative advantages of Schede's over Sauerbruch's, states that the former is simpler, as only the soft tissues and muscles need partial division, the scapula being included in the skin muscle flap. It will be remembered that in Sauerbruch's operation (Fig. 15) the incision is made in the right side and anteriorly. After turning the skin-muscle flap, the first, second, and third costal cartilages and part of the rib are resected, the clavicle divided at its inner third, and the esophagus then pulled forward from below the trachea. The operation gives very good access to the upper portion of the esophagus if it is movable, and is especially valuable in removing foreign bodies. But beneath the aortic arch the operation does not give good exposure, and Sauerbruch himself excludes from radical operation all cases with adhesions around the esophagus. In regard to the second point, Reich<sup>1</sup> has published an exhausting study with reference to the serious effect of traumatic irritation of the vagus on the pulse and respiration. Meyer<sup>2</sup> made the same observations in his four operations. The utmost gentleness must be used in handling these nerves, and the operation will almost invariably result fatally if both are injured. Reich proposes blocking the nerves, and it may be that the method advised by Crile in the operation for laryngeal cancer will be of service in the future. As to the technique of operation, I would refer the reader to the papers by Meyer, wherein the entire subject of technique has been reviewed several times. He prefers, at the present time, to operate in two stages in cases of cancer of the upper two-thirds of the esophagus. At the first operation he advises an incision in the eighth left intercostal space, and if, after inspection and palpation, resection appears feasible, the tube should be isolated below the tumor, divided, and both ends invaginated. The intercostal wound is

<sup>1</sup> *Beiträge z. klin. Chir.*, 1908, vol. lvi, p. 684.

<sup>2</sup> *Surg., Gynec., and Obst.*, 1912, vol. xv, p. 645.

then closed, and the thorax drained under differential pressure. Seven to ten days later a Schede incision is made, and an entrance effected through the third and sixth intercostal spaces; the pneumogastric nerves are carefully dissected off the growth, the esophagus loosened and resected. The upper stump is then deeply invaginated, drainage effected, and the patient again placed under differential pressure. He leaves as an open question the possibility of reversing the plan and dividing the tube above the tumor at the first operation. As to the

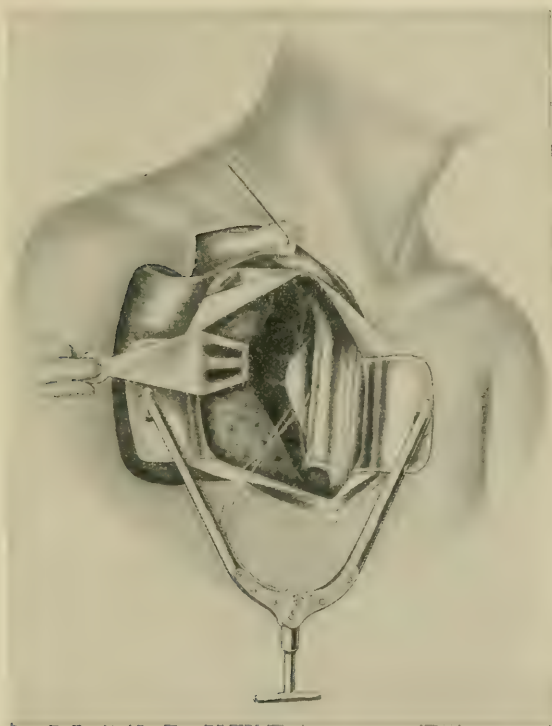


FIG. 15.—Sauerbruch's incision to reach the upper portion of the esophagus from the right side. (From Sauerbruch-Schumacher, *Technik der Thorax-Chirurgie*, page 96.)

invagination of the stump, always difficult in the depth of the thorax, Meyer now places a purse-string silk suture penetrating the esophageal wall at four different places. The three loops thus formed are caught with forceps, and the two ends with a different type of forceps. When ready for invagination, the operator holds the three loops on the stretch while the assistant, pulling on the two ends, invaginates the stump. When the forceps on the loops come in contact with the esophageal wall, they are removed, and the purse-string pulled taut and tied. Meyer has also placed a graft of fascia over the stump as an additional



precaution against leakage. At the close of his paper, he states "that if it were but once demonstrated in any part of the world that recovery after esophageal resection is possible, it would be the starting-point of faith on the part of laity and profession in the possibilities of thoracic surgery with reference also to this important chapter. The awakening of this confidence is what we need."

This hope of Meyer's has seemingly been realized, two cases having been reported last year in which resection of the thoracic portion of the esophagus was followed by success. The first was reported by Zaaier<sup>1</sup> from Korteweg's Clinic at Leiden, and the second by Torek<sup>2</sup> from the German Hospital in New York. Zaaier's case was a man, aged fifty-four years, suffering from difficulty in swallowing and obstruction 45 cm. from the teeth. The first operation was performed November 15, 1912, and it was discovered that a hard, indurated tumor existed in the cardiac portion of the stomach involving the esophageal opening; no metastasis could be felt. A Kader gastrostomy was performed in the pyloric part of the stomach. On December 10, 1912, the second operation was performed, and an incision 25 cm. long was made obliquely over the side of the chest. A subperiosteal resection was then done of a large portion of the sixth, seventh, eighth, ninth, tenth, eleventh, and twelfth ribs. The pleura was punctured, but was repaired by suturing the intercostal muscles over the defect.

Shortly after this operation the patient had dyspnea, a poor pulse, and rales were heard over both lungs. The patient recovered, however, and the next day the rales were less distinct. On December 9, 1913, the third, and final, operation was performed, the anesthesia being administered by the Roth-Drager apparatus with positive pressure. An incision was made in the left hypochondrium in the nipple line backward to the posterior axillary line, and then upward to the spine of the scapula. The peritoneal cavity was opened as was the pleural cavity. The latter contained a clear, yellow fluid, the left lower lobe being atelectatic, but the lung was free. The pleura was incised over the esophagus, and the latter isolated. The diaphragm was then incised circularly around the esophagus, a difficult part of the operation, and the stomach cut across near its middle in the way usually done in gastrectomy operations. The stump of the stomach, including the growth and the esophagus, were then drawn out, and the opening in the diaphragm closed. The esophagus was then sutured to the parietal pleura near the upper end of the wound at a point 4 cm. above the growth, clamped, divided with the cautery, and the lower end of the upper stump ligated. The wound was then carefully closed, a small piece of gauze saturated with iodine solution being packed around the esophageal stump. The operation lasted three hours, but, at its

<sup>1</sup> Beitr. zur klin. Chir., 1913, vol. lxxxiii, p. 419.

<sup>2</sup> Surg., Gynec., and Obst., 1913, vol. xvii, p. 614.

termination, the patient was in good condition. Three days afterward the ligature on the esophageal stump was removed, and the patient drank water which was evacuated through the fistula. Twenty-two days after operation, the patient was in excellent condition, and it was possible to connect the stump of the esophagus to the gastrostomy opening so that the patient could swallow his own food.

Torek's case was in a woman, aged sixty-seven years, with a carcinoma of the esophagus beginning a little above the lower border of the arch of the aorta and extending from there downward for  $1\frac{1}{2}$  inches or more. She had had a gastrectomy performed some time previously. The radical operation was done on March 14, 1913.

The incision was made through the whole length of the seventh intercostal space from the posterior end of which it was extended upward by cutting through the seventh, sixth, fifth, and fourth ribs near their tubercles. Extensive adhesions between the lung and parietal pleura were encountered requiring separation. The tumor was found to be firmly fixed just below the lower border of the transverse portion of the arch of the aorta. The esophagus was exposed below the tumor by incising the pleura, drawing the vagi aside and lifting the esophagus out of its bed. At the site of the tumor, the dissection of the vagi was difficult, and some of the branches were cut, but vagus collapse did not occur. In order to dissect the esophagus from behind the arch of the aorta, it was necessary to dislodge the aorta at that site and lift it forward, after having ligated and divided a number of its thoracic branches. Torek then dissected the esophagus loose from its attachments all the way up to the neck, divided it with a cautery at a safe distance below the carcinoma and brought the esophagus, with the tumor, out through an incision in the neck at the anterior border of the left sternocleidomastoid muscle. The lower stump was invaginated with two successive purse-string sutures of silk. The thorax was then closed, silk threads being used to hold the seventh and eighth ribs together, chromicized catgut for the muscles, and silkworm gut for the skin. No drainage was employed.

He then made a transverse incision in the skin over the second intercostal space, tunnelled the neck and brought the lower end of the upper stump of the esophagus through the tunnel and sutured the edge to the skin. The first wound in the neck was then closed.

The patient made a good recovery, the pulse, respiration, and temperature becoming normal by the fifth day. After the eighth day, the upper opening was connected with the old gastrostomy opening by a rubber tube, and the patient enabled to swallow all varieties of food that could be chewed to an almost fluid state (Fig. 16).

To use Torek's cases as an example, it will readily be seen that the patient's comfort will be greatly enhanced if a method of connection is established between the upper stump and the stomach. This is a

problem which has engrossed the attention of surgeons for years, and there are many methods in existence. Thus we have Bircher's formation of a cutaneous tube from the skin of the chest; Wullstein's employment of the small intestine and the skin of the chest; Roux's esophago-jejuno-gastrostomosis; the combination of Roux's and Wullstein's methods by Lexer; the plastic formation of an esophagus from the wall

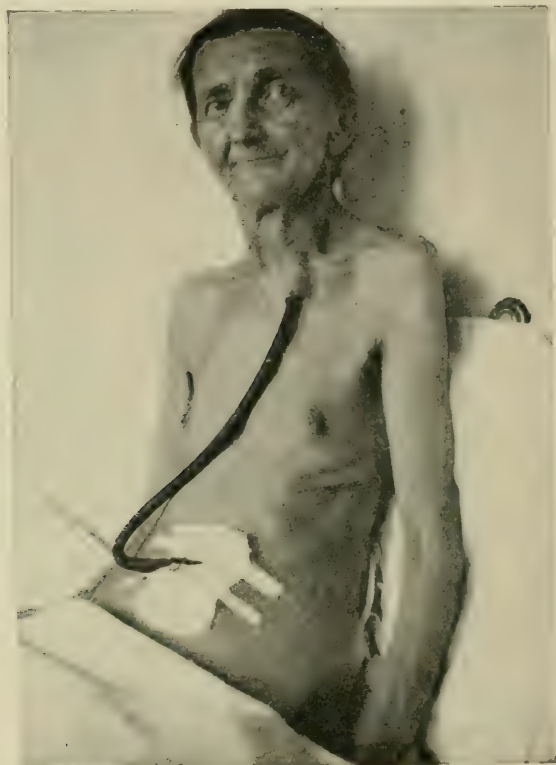


FIG. 16.—Photograph taken twelve days after operation. The incision at the anterior border of the left sternocleidomastoid muscle, through which the esophagus was taken out is scarcely recognizable. The esophagus has been placed under the skin of the chest and its end sutured to an incision in the skin. The gastrostomy tube is introduced into the esophagus whenever the patient desires to swallow.

of the stomach by Hirsch, and by the different method of Jianu; and finally, the employment of the transverse colon by Kelling and Vulliet.

Several of these attempts have been crowned with success. Lexer and Frangenheim each succeeded in giving the patient a useful tube by a series of plastic operations. The latter author<sup>1</sup> in a recent article cites various objections to the procedure of Rugh and of Jianu. He believes that the former method is not advisable, because of the danger

<sup>1</sup> *Ergebn. d. Chir. u. Orthop.*, 1913, vol. v, p. 406.



of gangrene of the intestine, and the latter is difficult to perform because, in patients suffering from stenosis of the esophagus the stomach is almost always contracted. He is a firm believer in the utility of forming the tube from the skin of the chest wall. Jianu's<sup>1</sup> operation has been tried by Roepke<sup>2</sup> with perfect success. Meyer<sup>3</sup> has also reported a case operated after this method, and it is from his article that I have

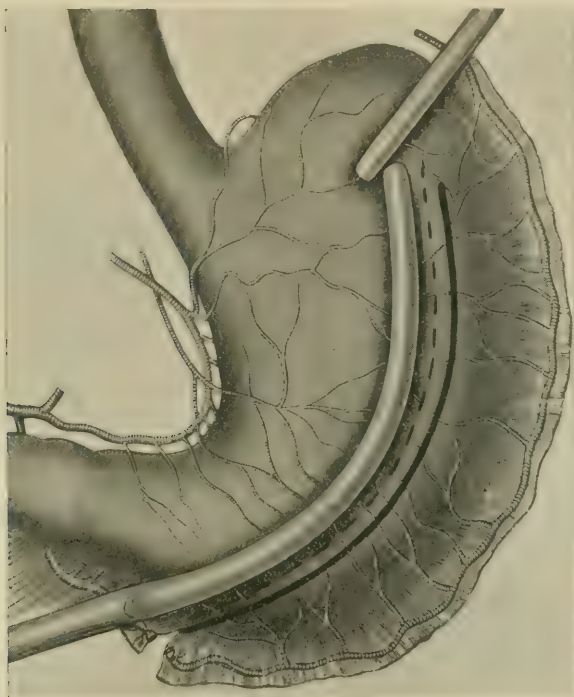


FIG. 17.—Major omentum has been divided (proximal ligatures are not shown in illustration). Right inferior epiploic artery doubly ligated and divided. It is wise to clear about three-fourths to one inch of the major curvature of the stomach toward the pylorus of omentum plus vessels. (This step, also, is not brought out in the illustration.) In the case reported no clamps were placed, but only the mattress suture (dotted line), which shut off the new tube from the rest of the stomach. The heavy black line represents the direction in which the scissors divided the stomach. (Taken from Jianu's article.)

taken the accompanying diagrams (Figs. 17 and 18). These pictures present better than words the method of formation of the tube. In Meyer's case, the tube, when placed upon the surface of the thorax, easily reached up to the cartilage of the third rib without any stretching.

<sup>1</sup> Deutsch. Zeit. f. Chir., 1912, vol. cxviii, p. 383.

<sup>2</sup> Zentralbl. f. Chir., 1912, vol. xlv.

<sup>3</sup> Annals of Surgery, 1913, vol. lviii, p. 289.

At the level of the cartilage of the third rib and one inch from the left border of the sternum, a horizontal incision was made, and a tunnel bored below the muscle with a large curved clamp. The latter grasped the Jianu tube and drew it up and out of the chest wound until the occluded tip projected for about half an inch. The abdominal wound was then closed by suturing, the upper sutures catching the stomach and thus lifting it up. The tube was then opened, and the edges of the mucous membrane sutured to the skin. There was some gangrene of the upper end of the tube due to the technical error of fastening it by through-and-through sutures. Meyer believes that only the mucous membrane should be sutured to the skin to avoid disturbing the blood

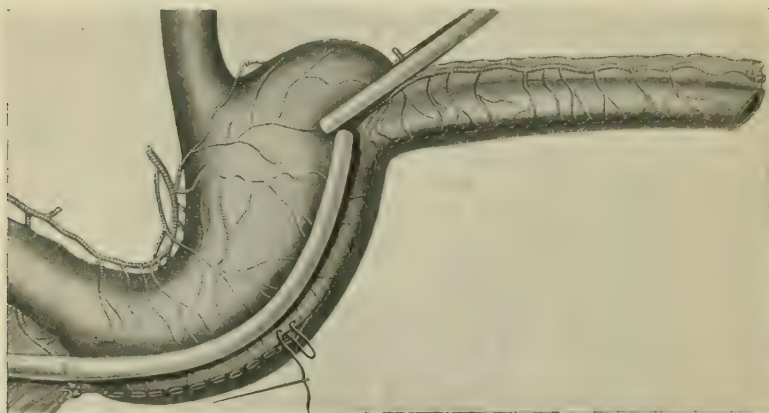


FIG. 18.—“Jianu tube” turned up; the second row of sutures (Lembert) is placed; note the splendid blood supply and pointing upward of the proximal portion of the major omentum which, after transposition of the tube to the outside of the chest, points to the right side of the patient. The one end of the tube remains in connection with the fundus of the stomach; the free end represents the gastrostomy opening, which eventually can be sutured to the lower end of the transposed oral stump of the esophagus, after resection of the intrathoracic carcinoma has been accomplished. (Also taken from Jianu’s article.)

supply. This patient suffered from a stricture of the esophagus, and Meyer intends a thoracotomy in the future. Meanwhile, the patient enjoys full diet, the food, after thorough chewing and salivation, being deposited in some kind of warm fluid and then washed down into the stomach through a funnel. In this article, Meyer states that he has recently made use to great advantage of Hueltl’s wire-stitching instruments in the formation of the Jianu tube in two patients operated on in March, 1913. In one, the new tube is 19 cm. long; in the other, 21 cm. In both, the gastrostomy openings correspond to the level of the third rib. No further details of these cases are given.

Meyer feels that it is better to place the Jianu tube beneath the skin in order to avoid infection and extension to the ribs. He was also

impressed by the transposition of the oral stump beneath the skin in Torek's case, and states that it would seem an advantage to have both tubes meet on the same level.

In regard to inoperable cases, he suggests dividing the esophagus proximal to the tumor and inverting the distal end. The oral stump may then be transposed beneath the skin of the neck and chest, and, if long enough, united with the opening of the Jianu tube. If too short, a connection would have to be made with a rubber tube or with a skin bridge. Von Fink<sup>1</sup> operated upon one patient in the following manner: The gastro-hepatic and gastrocolic ligaments were freed from the stomach by sectional ligation. The duodenum was then divided at the junction of the horizontal with the vertical branch, and the lower stump invaginated. The ninth rib was resected anteriorly, and the parietal peritoneum opened; the stomach was then drawn through this opening and up anteriorly beneath the skin. A posterior gastro-enterostomy was then performed. To the upper, free opening in the duodenum, a thoracic skin tube was attached. It was the further intention of von Fink, at a second stage, to resect the esophagus and bring the lower end of the upper tube forward into the neck and fasten it to the anterior thoracic skin tube. The latter part of the operation could not be carried out, as the patient died from perforation of the cancer.

An unusual method of resecting the esophagus for cancer below the bifurcation of the trachea has been advanced by Denck.<sup>2</sup> He has demonstrated the operation only on the cadaver and in animals. The operation consists of a blind loosening of the esophagus and its growth from the surrounding tissues by means of the finger or an instrument like a vein-stripper. He makes an incision 20 cm. in length, parallel to the left costal arch. If, after reaching the growth, it appears removable, he exposes the esophagus in the neck and mobilizes the upper portion in the same way. He then tunnels the chest and fastens the stump as in the previous methods. He then does a gastrostomy. The operation has little to commend it, and will probably never be done on the patient.

<sup>1</sup> Zentralbl. f. Chir., 1913, vol. xl, p. 545.

<sup>2</sup> Ibid., p. 1065.





# INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA, AND INFLUENZA.

By JOHN RUHRÄH, M.D.

THE usual number of articles have been written and published on the subject of infectious diseases during the past year, but probably there have not been as many articles of unusual interest, although there have been several remarkable contributions made to our knowledge of the transmissible diseases. It is manifestly impossible to refer to all, or even to the greater part, of the published articles. Many of them are only of interest to laboratory workers, others contain repetitions of well-known facts, and others deal with very technical studies of the subject, so that I have confined my attention to those articles which seem to me to have a particular interest for the physician in active practice because of their containing suggestions of practical worth or because of their throwing new light on the subject. The most remarkable contributions to our knowledge have been made by Noguchi, working in the Rockefeller Institute in New York. He has succeeded, by using a technique similar to that used for the growing of the spirocheta of syphilis, in growing an organism which he and Flexner regard as the *virus of poliomyelitis*, and following close upon the announcement of this was the publication of a preliminary report stating that by using the same method he had been able to produce a growth of the *rabies virus*. When one considers the vast amount of work that has been done, particularly upon the rabies virus, one appreciates to its full value, this contribution to medical science. The details of this work will be found later on under the appropriate heading.

The various epidemics of *cerebrospinal fever* that have occurred in the very recent times have given a renewed impetus to the study of that disease and of particular interest is the epidemic reported at Dallas, Texas, in which such remarkable work was done by Sophian and his associates. His studies deal chiefly with the antimeningitis serum, and concern the dosage, the technic of administration, and the results. The interest that has been taken in cerebrospinal fever has also led to the study of the other forms of meningitis, and to a better understanding of the various affections of the meninges. These include inflammations caused by the parameningococcus, the influenza bacillus, and the pneumococcus, and perhaps the chief lesson there is to learn

from these researches is the value of early lumbar puncture in making the diagnosis. It is manifestly impossible to make an exact diagnosis by any other means known at the present time. That a diseased condition is meningitis, the skilled diagnostician can generally ascertain, but as to the exact cause of that meningitis he must have recourse to the lumbar puncture to obtain the cerebrospinal fluid and then to a bacteriological examination to determine the nature of the organism present.

A number of contributions have been made to our knowledge of *diphtheria*. That of most importance, and one which I am sure will eventually come into general use, is a means of producing immunity by a mixture of antitoxin and toxin. This is more lasting than immunity, which is ordinarily produced by the injection of the antitoxin, and, as a method of preventing the disease, will certainly make its way into general practice especially as regards orphan asylums and other large groups of children.

The necessity for studies of large numbers of cases that have been carefully observed and records kept of the findings, is well illustrated by Rolleston's remarkable article on diphtheritic paralysis. This article gives us a more exact understanding of this affection and is of particular interest to the physician in active practice. Of interest too is the work which has been done on the virus of *smallpox* and *vaccination* by Fornet, and also the method of *vaccination against varicella*, as suggested by Medin and Kling. At the time that so much attention is being paid to the value of vaccines and of serums, one notes especially that the use of *chemicals in the treatment of disease* has not been forgotten, and two very suggestive therapeutic measures have been published, both relating to an incurable disease, rabies, and this suggestion consists in the use of very old drugs; one, the use of quinine, and the other is carbolic acid. Further experiments alone will tell whether these drugs have the virtue that is claimed for them, but, if the results obtained are true, we have at our hand a new method of combating this terrible disease.

*Whooping cough* has been a subject of a considerable amount of research work and contributions have been made concerning the pathology of the disease, the occurrence of complications, and a number of suggestions have been made about the treatment, but perhaps more important than any is the general tendency to regard whooping cough as a very serious disease which should be prevented by special means of control. The need for this is well illustrated in the article by Morse, and in numerous others.

With the opening of the Panama Canal, the diseases found in the tropics, and particularly those peculiar to South America, will become of special interest, not only to us in the United States but to European nations as well. The Harvard Commission, headed by Strong, have made a preliminary report upon the subject of *Oroya fever*, and they



believe that two diseases have been confused; one, an acute fever which they suggest the retention of the old name just mentioned, and the other a more chronic affection characterized by skin manifestations, and commonly known as *Terruga peruviana*. In addition, they have made a short study of a disease called *uta*, which clinically bears a considerable resemblance to yaws and to syphilis, and which they have demonstrated to be due to a form of Leishmania. Whether or not we should class *pellagra* in the transmissible diseases is undecided, but I have included certain studies bearing on this point which are well worth reading, and, while *pellagra* seems to be an infectious disease, it is necessary to await further investigations before one can decide this point. Another disease which will probably be found to be of infectious origin is that affection of the lymph nodes known as *Hodgkin's disease*, which has recently been studied by Bunting and Yates.

The subject of *insects as carriers of disease* has been of continued interest, and studies have been made concerning practically all of the commoner insects with this point in mind. This year the chief contributions concern roaches, the relation of bed-bugs to leprosy, the relation of lice to typhus fever, and the probable relationship of the stable fly to poliomyelitis.

We are gradually coming into a better understanding of the *care and of the prevention of the infectious diseases*, and to a more rational manner of handling them in hospitals. (See article by Richardson below.) Almost every city in the United States is woefully lacking in hospital facilities for caring for the infectious diseases. Boston and New York come nearer the ideal than any other place, but even in these two cities the number of beds supplied falls far short of what is believed to represent an efficient number. The English, who have devoted a considerable amount of attention to this subject, have suggested that one bed for every thousand inhabitants will approximately care for the so-called minor infectious diseases under normal conditions. In New York, the proportion is about 1 to 2500, in Baltimore about 1 to 17,000, and most of the American cities are either entirely lacking in the proper provision or come in the list represented by Baltimore, in which a feeble effort is made to provide isolation. Both scarlet fever and diphtheria may be easily and efficiently isolated, and both are spread chiefly in two ways: first, by direct infection of the individual from the patient, and secondly, by carriers or those who retain in their bodies the germs of the disease without actually having it, or who retain them for unusually long periods after an attack. It needs no argument to make clear that if the individual suffering with diphtheria and scarlet fever is isolated from the rest of the community, there will be neither cases nor carriers. Every case of one of these diseases which is not properly isolated acts as a focus from which the disease may spread, and each additional case thus caused starts a new point so that in spite of the efforts of the

health authorities these diseases remain epidemic in all of our large cities. In providing a place for the isolation of these diseases, the community would be acting in its own interest, and the building of such hospitals should not be regarded as doing anything very much for the individuals suffering with the disease, but rather to keep the remainder of the community well. It should be the duty of every health department to remove all such cases where they would no longer be a danger to the community. This, of course, cannot be done unless the city provides adequate hospital accommodations, not only for the very poor but for the well-to-do as well. In most American cities, there occur, every year, cases in boarding houses, in hotels, and in transit, a great many cases which tax the ingenuity of the physicians and the health authorities. Such a hospital requires the services of physicians specially trained in the management of infectious diseases and in preventing their spread, and such physicians should fill permanent positions with adequate salaries and free from political influences. The great need of American public health is trained health officers (see below), who devote their entire time to their public duty, who are properly trained and adequately recompensed. Apropos of the subject of health officers, I want to take this opportunity of again expressing the hope that we may not only have specially trained men for this work in the United States, but men who devote their entire time to the performance of their duties. To expect a man to practise medicine for a livelihood, and, for a mere pittance, to devote many hours a day to arduous, often disagreeable, and highly specialized work, is expecting more of human nature than it will ever accomplish. To do the best work a health officer must have plenty of time, must not be diverted by the attendance on labor cases or by emergency calls or any other things of practice which require immediate and constant attention. The part time, underpaid health officer of the United States is one of the jokes perpetrated on the community by the political bosses. It has, until recently, been the history of health officers that the most efficient are the soonest to be taken out of their positions by the politicians. We are gradually coming to a proper appreciation of the work of the health officers and when specially trained men who devote all their time to the work are handling this problem of public health from one end of the United States to the other it will be possible to do team work in the eradication and in the control of many of the infectious diseases. It seems a pity that in the United States, with its numerous societies for the prevention of this and that, and the many dollars spent in medical and related charities, there is so little correlation of the work. If every agency, including the state and municipal health officers and the other groups that are working for the betterment of mankind, could devote their entire time and energy to one or two diseases for a period of several years, some remarkable work could be

accomplished, and we would learn whether a disease could be controlled by certain means or not. If all the money and all the energy now going into misdirected work were expended in the next five years in the suppression of tuberculosis and of typhoid fever, and every bit of work carefully correlated, it would show not only a lowering of the death-rate of these diseases, but, according to the Mills-Reincke law, a lowering in the death-rate in other diseases as well. These two diseases take in the problem of fresh air, housing, the control of waterways, pure water, good sewage, and numerous other related subjects, and work such as this would do away with the almost useless puttering of the untrained and the inefficient people of the best of intentions and ideals, but who are lacking in the power to do effective work.

**The Necessity of Trained Public Health Officers.** I have insisted from time to time upon the necessity of having trained health officers if we expect to combat successfully the various infectious diseases. The method in vogue in most of our American cities having the health officers appointed for political reasons and changed frequently prevents the proper development of health departments, and particularly hinders the systematic fighting of the infections. Reinhardt<sup>1</sup> has called attention to the necessity of public health education and particularly to the necessity for teaching preventive medicine, and the various topics relating to public health. In Harvard and in the Universities of Pennsylvania, Wisconsin, and Michigan, complete separate courses are given to students, and the degree of doctor of public health conferred. It would seem to me to be a very useful thing to correlate the work in the various universities to making the requirements more or less uniform, so that if the degree comes into general use it would mean very much the same thing everywhere. It would seem that for the present time it might be wiser to limit the degree to students who have already taken their doctor's degree in medicine, but this has been deemed too long a course by some in that it requires a considerable amount of study on various topics which will not be used at all by the health officer who might therefore profitably employ his time in the study of other subjects. This part of the question is open to considerable difference of opinion, and this is not the place for such a discussion, but of the necessity for trained health officers there can be no doubt, and until the United States is supplied with them the work on the prevention of infectious diseases must proceed more slowly than it otherwise would.

**Team Work in the Study of Epidemic Diseases.** Our knowledge of the infectious diseases has advanced with tremendous rapidity, but there is no question that the solution of many problems which now baffle investigators will come through carefully organized work. In solving problems in connection with many infections, more is needed

<sup>1</sup> Journal of the American Medical Association, February 8, 1913, p. 427.



than merely to study the disease in the laboratory. It is necessary to have all the different phases of the disease studied at the same time and to have the work carefully correlated. As an example of this, the work of the Massachusetts State Board of Health in the investigation of infantile paralysis<sup>1</sup> is of great interest and points the way to others. In 1907, the New York epidemic called special attention to the disease, and it was evident that in Massachusetts there were more cases of poliomyelitis than had occurred in previous years. In 1908, circular letters were sent out by the Board to every physician in Massachusetts, and the reports of cases so located were carefully studied. The following year the same method was used when it became evident that it would be necessary to employ a special worker in order to obtain uniformity in the reports. For the first four years, data of various kinds were collected, and analyzed, and at the end of four years certain deductions were made from the facts collected. The first point, which was evident, was the fact that the disease was ordinarily one of the country or the small town. The seasonal occurrence was that it was a warm weather disease and that it reached its height in either July, August, or September, but never quite disappeared, even in winter. Investigations in regard to the house, whether the disease occurred on any special floor of the house, whether it followed dampness, or dryness, whether proximity to railroads or whether dust had any effect and similar questions, were all carefully investigated. The disease has been studied, also, in reference to insects, and, of course, flies were reported in about 90 per cent. of the cases, and mosquitoes in over 40 per cent., but this is very much what might be expected of any disease occurring at the same time of the year. The suspicion that the disease is transmitted by some insect led the board to employ an entomologist, and, in 1911, between July 30 and September 26, eighty-eight patients in 17 cities and towns were visited and the stable fly was found in the environment in practically every case investigated. This and the mosquito were the only biting insects found constantly present. It was thought that if the mosquito was the cause of the spreading, it would be much more widespread, and that it would also frequently attack adults as well as children. Rosenau was then asked, on behalf of the board, to undertake the experiment of transmitting the disease from monkey to monkey by means of the stable fly, and his results were reported at the Congress of Hygiene in Washington on September 26, 1912, and these results have been confirmed by Anderson and Frost. It will be seen that this method of attacking a health problem in any community with the view of solving various questions in regard to it is the one from which, in the future, we may hope to obtain the greatest amount of success. First, the location of the disease by enlist-

<sup>1</sup> Lovett, Boston Medical and Surgical Journal, January 23, 1913, p. 109.

ing the services of every physician in the practice of medicine, then making use of trained investigators in following up this information, and the study of the data thus obtained by experts in various lines of science and then the study of the various features of the disease by thoroughly trained investigators would seem to promise a solution of the various problems under consideration.

**The Hospital Management of Contagious Diseases.** Our ideas concerning the transmissibility of the common infectious diseases have been undergoing many changes in recent years, and these have been put into actual practice in certain hospitals. Richardson<sup>1</sup> has collected some of the hospital experiences which will be found extremely interesting by those having to deal with this problem. Over ten years ago, I called attention to the remarkable work of Grancher who was among the first to put into practice his views in which there was expressed the doubt of the aërial transmission of these diseases. In the *Hôpital des Enfants Malades*, in Paris, he isolated contagious diseases in the wards. From 1890 to 1900, there were 6450 patients admitted to his wards. Diphtheria was admitted forty-three times, and only once did the disease develop in the ward. There were 19 cases of scarlet fever introduced, and 7 cases developed; while in measles the results were not as good, but the incidence of measles was reduced two-thirds. The only precautions taken were wire screens placed about the beds to indicate that the nurses were to put on sterile gowns and to sterilize their hands after handling the patient, and to see that towels and utensils were sterilized before being used for other patients.

From this work of Grancher has developed the modern method of handling infections about which I have commented many times. One feature of the work is what might be termed *aseptic nursing*. It is absolutely necessary for the success of this method, or any of its modifications, that nurses and physicians attending the patients follow implicitly certain simple rules regarding the transmission of the disease by direct contact, or by close contact with fomites. This means the wearing of a gown, the disinfection of the hands, the separation and disinfection of everything which comes in contact with the infected patient. Various forms of isolation are employed. One method is to merely use a screen, as did Grancher, to indicate that the patient is suffering with an infectious disease. The second method is to separate the patient in compartments, so-called boxes, of which there are two types. In one, the walls of the box extend only six or seven feet above the floor, leaving the air space above perfectly free, and sometimes there is an air space left below the box which sometimes facilitates the cleaning of the floor. In the other method the compartments run to the ceiling, and the boxes are so arranged that they can be cut off entirely from

<sup>1</sup> Journal of the American Medical Association, November 22, 1913.

the rest of the ward. The best system is to have the rooms arranged so that they may be entered from the ward or from a veranda through the window.

In the Plastow Hospital, Biernacki has been using the barrier system as well as the cellular block system in which the rooms are back to back with glass partitions, with access to the rooms from the verandas. Biernacki would isolate the following diseases with the barrier system—diphtheria, whooping cough, mumps, rubella, typhoid fever, septic infections, and ringworm. He does not attempt to isolate measles or chicken-pox, and hesitates to do so with scarlet fever. These diseases, as well as typhus, are treated in the cellular block system. His statistics have not yet been published, and he has not as yet formulated any final decision.

Caiger, at the Southwestern Hospital of London, has made a report on the cubicle system, in use for eighteen months, ending in 1908. The partitions used were 7 feet high, the lower half being granite silicon plaster, and the outer half glass in a metal frame. In all, 704 patients were entered, of whom 289 were scarlet fever convalescents who were kept for two days and nights before being given their final discharge. Of the remaining 415, some were kept on account of the diagnosis being uncertain, some because it was thought that a second disease was possibly incubating, some because the patients had two infectious disease, and some with infections that it was thought best to keep in separate isolation. There were 163 cases of scarlet fever in the eruptive stage of the disease, 82 cases of German measles, 22 cases of measles, 31 cases of diphtheria, and 17 cases of whooping cough. Twenty of the 704 patients alluded to developed a second disease. Three of these had the disease on admission, and one was infected by a ward maid who had diphtheria. Of the remaining 16, 6 were scarlet fever, 6 were chicken-pox, 2 were German measles, and 2 were measles. Curiously enough, in 2 instances, 1 chicken-pox and 1 measles, there had been no recognized case of this disease in the ward for six weeks and two months respectively. In 1911, he reported, in all, 2547 patients that passed through the cubicles during the five years that they had been in use, and they had proved to be of the greatest possible value. In the cubicle wards, the incidence of secondary infections was 1.8 per cent., whereas in the general ward it was 7.6 per cent. Several other reports are discussed which offer somewhat similar experiences. The most successfully managed hospital of this kind is the one at the Pasteur Institute in Paris, which is well worth a visit. In this hospital even chicken-pox is admitted, and this has been done with practically no cross-infections. At the Herold Hospital in Paris the cubicle method is employed, and I saw measles patients being treated side by side with others without any cross-infections.

Richardson also makes the report for the Provident City Hospital



for three years, from March 10, 1910, to March 10, 1913. This hospital was built, and aseptic nursing introduced, by Chapin who has done so much to popularize our knowledge of the transmissibility of the infectious diseases. Patients are accommodated in three two-story buildings, one for scarlet fever, one for diphtheria, and one an isolation building for all other infections and mixed cases. The partitions run from floor to ceiling, provision being made for larger rooms in which several cases of the same disease may be cared for on the same plan.

The resident physicians live in the administration building, and all eat in the same dining-room; while in the ward, white duck suits are worn and if it is necessary to make examinations or come in contact with the bedding, an additional gown is put on which is left in the gown- and wash-room where the hands are washed with soap and water before going to any other duties. The physicians are trained, when not wearing the gown, to avoid allowing the clothing to touch the bed or anything else. Short-sleeved jackets are used to prevent sleeve infection. The nurses all sleep in the same home and use the same dining-room, and when off duty are allowed to leave the hospital as they would be in any general hospital. The nurse leaving the ward enters the dressing-room of that ward where each nurse has two metal lockers: one for clean clothes and one for infected clothing. When going off duty she changes the dress, cap, apron, and bib, and washes her hands and face and puts on her uniform. The sleeves of the uniform are either short or rolled up. The maids and other helpers put on gowns when they enter the wards. The same kitchen is used for the food of the patients and employees. The food is sent to the kitchen in paper boxes and in paper trays which are destroyed. Such dishes as must be passed between the kitchen are boiled before leaving the ward and washed again in the main kitchen. The patient himself is regarded as the greatest source of infection. The idea of the disease being transmitted by contact has been followed and air transmission disregarded except as regards the coughing or sneezing of a patient directly into one's face. The patients are brought to the hospital in the same ambulance or in a coupé, and these are of ordinary construction except that they can be washed with soap and water without damage. The attendant and driver wear clean, washable coats on every ambulance trip. Inquiries are made as to the presence of other recent infections of the patients or of anyone else in his house. Blankets are placed about the patient, and he is brought to the hospital and enters the admitting room appropriate to his disease. The driver and attendant return to the stable and remove their coats, wash their hands, and the blankets and coats are put in a hamper and later sent to the laundry for sterilization. The interior of the coupé or ambulance is then washed with soap and water. In the admitting room, cultures are taken from the nose and throat, and also

a vaginal smear, and, even though the case may apparently be uncomplicated, it is held from five to seven days or even longer. The patient is kept in a detention room off the ward where aseptic precautions can be observed. If there is any doubt as to the diagnosis, or exposure to other diseases, the patient is sent to the isolation building or is regarded as a barrier case by placing a red card on the bed. The patients who are in detention or in the barrier beds are kept in bed, and not allowed toys nor anything else that can be thrown from bed to bed.

Nurses and doctors wash their hands after washing the patient; each patient is supplied with a basin, bed pan, etc., which are kept beside the bed of the patient and boiled after using; a gown is also kept for the use of the doctor and nurse in case of need. Running water and bar soap are used with a brush and a separate towel every time the nurse or physician touches the patient or anything in the room; after handling measles and chicken-pox, in addition to the washing, a one minute immersion in an antiseptic solution is required. All dishes and nursing utensils coming from patients are put in a steam sterilizer, if possible, and a 1 to 20 phenol solution used for rubber and glassware. Bed pans and urinals are emptied and put in a 1 to 20 phenol solution for an hour or more before being used again.

Among the 17 physicians who work in the wards, diphtheria occurred three times, or 18 per cent. Among 47 graduate nurses, scarlet fever developed once, 2 per cent., diphtheria twice, 4+ per cent., German measles once, 2 per cent. Among 183 pupil nurses who worked in the wards for two months, scarlet fever occurred eleven times, 6 per cent., diphtheria ten times, 5.4 per cent., rubella once, 0.5 per cent. Among 11 nurses, no disease occurred. Among 18 kitchen maids, one developed scarlet fever, 5.5 per cent., and one diphtheria, 5.5 per cent. One laundry maid developed scarlet fever, and the night telephone operator developed diphtheria. In the diphtheria ward, of 861 patients admitted, 2 had contracted scarlet fever, 1 diphtheria, 18 chicken-pox, 3 German measles, 3 whooping cough, a total of 27, or an incidence of secondary infection of 3.1 per cent. In the scarlet fever wards, of 649 patients admitted, 3 had contracted diphtheria, measles 4, German measles 1, chicken-pox 13, a total of 21, or an incidence of secondary infection of 3.2 per cent. In the isolation building for the other diseases, 842 patients had been treated, 151 of which were there less than a week, and 691 more than a week. The patients admitted suffered from the following diseases:

Chicken-pox . . . . .	76
Diphtheria . . . . .	137
Diphtheria carriers . . . . .	138
Erysipelas . . . . .	3
Influenza . . . . .	1
Measles . . . . .	242
Mumps . . . . .	11
Noma . . . . .	6
Ophthalmia, gonorrheal . . . . .	2
Rubella . . . . .	37
Scarlet fever . . . . .	231
Syphilis . . . . .	1
Tonsillitis . . . . .	22
Tuberculosis, pulmonary . . . . .	16
Vaginitis, gonorrheal . . . . .	8
Variola . . . . .	2
Vincent's angina . . . . .	4
Whooping cough . . . . .	128
Tinea tonsurans . . . . .	1
	<hr/>
	1066
Non-infectious diseases . . . . .	88
	<hr/>
Total . . . . .	1154

The excess of diseases over the number of patients is accounted for by mixed cases. Chicken-pox developed 8 times, measles 25 times, scarlet fever 10 times, or a total of 23 cases, or an incidence of 5 per cent. Richardson concludes, and one can really agree with him, that the following diseases can be safely treated by the cubicle system. Diphtheria, scarlet fever, whooping cough, rubella, mumps, and gonorrheal infections. The questionable diseases are measles, chicken-pox, and smallpox. With perfect technique, I believe that measles can be treated in cubicle wards. Chicken-pox and smallpox had better be treated in hospitals constructed along the cellular block system, or some similar plan where the partitions run from the floor to the ceiling. It seems possible that the infections in measles may be due to faulty technique which subsequent study and observation will clear up because the experience in some hospitals differs widely from that in others, but just what the fault is, beyond general carelessness, would be difficult to say. It will be exceedingly interesting to have some definite observations on just how far chicken-pox and smallpox will travel through the air. The distance is certainly very slight, and with a disease as mild as chicken-pox there does not seem to be any reason why experiments should not be undertaken to determine this very important point which might clear up certain things regarding the isolation of both diseases.

**Fresh Air and the Prevention of Infections.** One meets in practice a certain class of cases which are more or less difficult to cope with unless very radical changes are made in the life of the individual. I refer



to persons of lowered resistance to infection, and this is particularly true of children, this lowered resistance is sometimes due to some previous disease, especially whooping cough or measles, but, in many instances, is simply due to living in overheated apartments and being crowded in with numerous other children in overheated school-rooms. The result is a child who, in spite of all other care, develops frequent infections, especially of the nose, throat, or lungs. It frequently happens that these children regain their vitality during the summer months, especially if they have been sent to the country, but lose it again on their return to school.

Of recent years I have found that the only satisfactory method of dealing with these children is, first, in the more severe cases to send them into the open country, preferably to a farm for a period of three or four months, and then, on their return to the city, to have them sent to some school where there is an open-air class. Unfortunately, there are not very many such classes, although apparently they are on the increase. A very interesting report of an open window experiment is contained in the observations made by Roach at the Bache<sup>1</sup> School in Philadelphia. An open-air class was started in which the occupants were protected in extremely cold weather with sufficient wraps, and draughts were carefully excluded. The windows, however, were left wide open and, except in very severe weather, the heat turned off. The room was equipped with desk chairs so that they could be moved aside to clear the floor space for physical exercise, and this also permitted the children to be so seated that their eyes were protected from the light. Platform scales with a measuring attachment were provided, and, when the weather was sufficiently cool, woolen blankets, sweaters, woolen caps and hoods and knitted woolen gloves were supplied. The experiment so conducted was not for sick children but for well children, and the regular school program was followed with the exception of some modified physical exercises. Forty-four children were in the room, and forty-four other children who were in the ordinary warm room of the school were used for a comparison. It was found that the children in the cold-air room, both those that were up to par and those who were below normal, gained steadily in weight, while those in the warm-air room gained slowly and then lagged. There were fewer children in this room with colds, and it was also found that the children in the open-air room did better in their studies than those in the warm room. This method of treating normal children is well worthy of consideration, and for the subnormal and especially for the class to which I have referred it is particularly to be recommended.

**The Purification of Water.** The question of obtaining a water for human consumption which shall be free from disease-producing substances has for a long time occupied the attention of hygienists. Various

<sup>1</sup> American Journal of Public Health, February, 1913, p. 138.

suggestions have been made from time to time, boiling when practicable is the more simple but this often cannot be used, and when the water is cloudy, owing to the presence of foreign material, the use of a filter or the addition of alum may precede the boiling. It sometimes happens, as in the recent floods in the middle west, that the means to boil water are not at hand when needed most. The method which is recommended by the officers of the United States Public Health Service<sup>1</sup> is to purify the public water supplies with hypochlorite of lime, and where there is no public water supply, or where it has been destroyed, the hypochlorite solution should be distributed to the private homes for use in the purification of drinking water. A satisfactory solution may be made by adding one teaspoonful of chlorinated lime to one pint of water. Of this solution, one teaspoonful may be added to two gallons of drinking water. This should be thoroughly mixed, and should be allowed to stand for at least one-half hour before being used. This method furnishes a cheap, practicable method of supplying a water which will be free, at least, from the germs of the diseases most to be feared.

**The Common House Roach as a Carrier of Disease.** In searching for the cause of the transmission of various infections, almost every insect and lower animal has at one time or other come under suspicion. In spite of this fact, very little attention has been paid to the common house roach with which we all are familiar. Longfellow<sup>2</sup> has made a short study of the bacteria-carrying abilities of this insect. The roach feeds upon all kinds of breadstuffs, milk and its products, water, clothing, cooked foods, and the feces of their own species and of other insects, and they migrate from one place to another, generally following water and drain pipes. Roaches caught at random were found to contain the colon bacillus, proteus, the *Staphylococcus aureus* and *citreus*, and a bacillus of the *subtilis* type. This was determined by placing the roaches in sterilized flasks and allowing them to remain for forty-eight hours, after which they were removed and the flask partly filled with nutrient bouillon and incubated. The feces and the insides of the bodies of roaches were found to contain the same varieties of bacteria, and, in addition, a virulent streptococcus was isolated from some of the insects. It was found by experiments that, if hungry, the roaches would eat the feces of each other, so that typhoid bacilli which had been fed to one set of roaches could be recovered in a second set. By careful experiment, it was also determined that the roaches could carry diphtheria bacilli if they ate food contaminated with it, and the same was proved to be true of various types of streptococci, staphylococci, and the common chromogenic bacteria, such as the *prodigiosus*, the *violaceus* and *pyocyaneus*. It was more difficult to prove the possible transmission of the pneumococcus, but by feeding pneumococci to

<sup>1</sup> Public Health Reports, April 18, 1913, p. 17.

<sup>2</sup> American Journal of Public Health, January, 1913, p. 58.

the roaches they sometimes could be recovered. Experiments with the meningococcus were even less favorable, probably due to the fact that the temperature of the roach was not sufficiently high to keep the organism alive. Longfellow also believes that roaches are capable of picking up and transferring the tubercle bacillus, although he has had no definite opportunity for demonstrating this.

**The Life History of the Stable Fly.** The fact that the stable fly, *Stomoxys calcitrans*, has been thought to be at least one of the means of transmitting poliomyelitis, the life history of the insect becomes of particular interest. Mitzmain<sup>1</sup> has been making a study of the fly and has established a certain number of facts in connection with it, which are briefly as follows: The female may begin laying eggs at the age of nine days, and the maximum number produced by a single fly is placed between 632 and 820. These eggs are laid at about 20 different times, the maximum number deposited at any one period being 94. The eggs hatch in from twenty to twenty-six hours if the temperature is between 29° and 31 C°, and under favorable conditions the larval stage lasts from seven to eight days. The imago emerges from the puparium generally in five days. It is usually ready for biting from six to eight hours after this. Experimentally, flies feed upon vertebrate animals, and seventeen different species have been noted, including man, rodents, birds, and reptiles. It has also been observed that, in case of live-stock of any kind, this fly opens a wound from which non-biting flies may subsequently draw blood and flies which are not able to bite may thus take into their bodies the parasites from the animal from which they have fed. The longest periods flies are observed to live is seventy-two days for the female and ninety-four days for the male. The length of time which it takes the fly to develop from the egg is, under the most favorable circumstances, about twelve days, but this period varies, and when light is excluded and there is absence of moisture it may be delayed as long as thirty-five days. Further study is needed to determine whether these flies carry the virus of disease, and it is to be hoped that, in the near future, exact contributions will be made upon this subject.

**Lambliia Spores in the Contamination of Food with Human Excreta.** Stiles<sup>2</sup> has called attention to the fact that the presence of certain protozoa (*Entamoeba coli*, *lamblia*, and *Trichomonas*) in the human intestine means that the person in question has swallowed human excreta. His argument is as follows: These protozoa are obligatory parasites having no free motile stage. The stage outside the body is a spore characteristic for each one of the separate forms. In spite of some of the references in the older literature, there is nothing at present to prove that these three species of parasites are characteristic for any

<sup>1</sup> Public Health Reports, February 21, 1913, p. 345.

<sup>2</sup> Ibid., February 4, 1913, vol. xxv, p. 290.



host other than man, although generically identical, but specifically distinct, forms are known for other animals. Some of these were formerly considered identical with the species in man. Even if it be admitted that some of the forms in animals other than man are specifically identical with the forms in man, the argument will remain much the same. These organisms leave the body only in discharges, the *Entamoeba coli* and *lamblia* in the feces, the *trichomonas* in the feces, the vaginal discharge, or in the urine. They enter the body in spore form. The *Entamoeba coli* and *lamblia* enter through the mouth. The *trichomonas* enter through the mouth, but exceptionally through the vagina or urethra during coitus. For practical purposes, it may be stated that the parasites leave the body with the feces and enter it in the spore form through the mouth. It has generally been assumed that infection occurs either through water or through vegetables, but Stiles and Keister<sup>1</sup> believe that the chief method of transmission is the mechanical carrying by flies through the feces usually from surface privies to the food in the kitchen or dining-room. They made a study of a certain village where there were approximately 200 houses each with a surface privy in the back yard. The flies breed by the thousand in these privies and fly to the house. In these villages, they found that the protozoa in question were exceedingly common among children and it was not uncommon to find that from 50 to 100 per cent. of the feces contained these protozoa. In this village, contamination by water can be very largely eliminated. That the fly can carry small particles large distances is well known, and does not need demonstration. Flies caught in the house and in the privies were examined, but with a negative result, but when one considers the minute size of the spores this is not a matter of surprise. Experiments made with a specimen of human feces, known to contain a large number of *lamblia* cysts, showed that the *lamblia* could be demonstrated upon the flies that had fed on such feces. In children in families living in houses connected with sewers, the percentage of children infected was somewhat lower, but as large numbers of the houses with sewer connections were close to those without any such connection, and with privies this merely meant that there was slightly lessened possibility of fly-borne infection in the houses where sewer connections were made. Stiles believes that this is another argument for the improvement of sanitation, in preference to either doing away with the surface privy or in rendering it harmless by using one of the sanitary designs that have been suggested.

**The Lymphocytosis of Infection.** A considerable amount of work has been done in reference to the reaction of the white-blood corpuscles in various forms of infection. A great deal more information is needed on this subject, and a short article of considerable interest is that of

<sup>1</sup> Public Health Reports, November 28, 1913, vol. xxvii, p. 3520.

Cabot.<sup>1</sup> He found that in wound sepsis, boils, and widespread streptococcal adenitis of tonsillar origin, there may be a lymphocytosis so pronounced as to suggest lymphoid leukemia. This is a very important point in clinical diagnosis and one not familiar with the facts might easily be led to a mistaken interpretation of certain symptoms. There is no reason known for this substitution of lymphocytosis for the usual polynuclear leukocytosis of infection. The distinction between such a lymphocytosis and leukemia depends largely upon the recognition of an infectious origin, upon the lesser degree of lymphocytosis in the infectious type and upon the course of the disease.

**Bradycardia in Infectious Diseases.** Roger<sup>2</sup> has reviewed the recent literature on this subject, which is quite large and which has attracted a certain amount of attention. The most common forms of bradycardia are due to infections which are quite well known, although sometimes the infection as a cause may be overlooked. That due to syphilis has been particularly studied by Breciout.<sup>3</sup> Of the other diseases which frequently cause bradycardia, diphtheria, pneumonia, typhoid fever, rheumatism, and mumps are the most important. A slow pulse may be caused by smallpox, and has been noted in scarlet fever, malaria, and influenza. Certain forms of infection, as those affecting the biliary passages and the meninges, may also be accompanied by a slow pulse. In appendicitis, a slow pulse has been noted by many observers. It was first thought to be a sign of gangrene, but since then it has been seen even in very benign cases, and one view is that, in these cases, it is a reflex analogous to the changes caused by the pain in pneumothorax by irritation of the solar plexus. It seems that almost any infection, at times, may cause a slow pulse, and it is important to note that it has been observed in the course of gonorrhea, in acute infectious nephritis, and in anginas, other than diphtheria.

One very important form of bradycardia which may lead to mistakes in diagnosis is that which very exceptionally occurs in tuberculosis, and which was noted as early as 1860 by Guéneau de Mussy. He believed it to be due to irritation of the pneumogastric nerve by enlarged tracheal and bronchial lymph nodes. More recent authorities believe that it may be caused by the tuberculosis toxin. One should always be careful to rule out the slow pulse caused by digitalis or the salicylates, and also the presence of arteriosclerosis, and, so far as possible, auto-intoxication of renal or biliary origin. The treatment of the condition is largely directed toward the infection which causes the trouble, but Roger believes that, if the heart muscle is weak, camphorated oil, caffeine, or other heart tonics, may be used, and an ice-bag may be placed over the cardiac region. Atropin, used for diagnostic purposes, has been known

<sup>1</sup> American Journal of the Medical Sciences, March, 1913, p. 335.

<sup>2</sup> La Semaine Médicale, June 18, 1913, p. 289.

<sup>3</sup> Thèse de Paris, 1912.

to relieve the condition, while digitalis is ordinarily contra-indicated as slowing the action of the heart.

**Intestinal Parasites in Children in America.** At the Fourth International Congress of School Hygiene in Buffalo, held in August, 1913, there was a paper presented by Farrell, of the Rockefeller Sanitary Commission, dealing with the rural school as a factor in spreading infection. This paper gave the summary of the findings of the commission in the cases of 46,794 children found harboring intestinal parasites. Of these 22,778, or 48 per cent., had hookworm infection; 7991, or 20 per cent., had ascarides; 2915, or 6 per cent., had *Trichocephalus dispar*; 1246, or 2 per cent., had dwarf tapeworm; 134, or 0.2 per cent., had strongyloides, and 46, or 0.09 per cent., had *Oxyuris vermicularis*. It is of particular interest to note that many of the cases of ascaris infection showed marked symptoms of retardation and of anemia. The number of cases found with ascaris infections seems much larger than one would have believed possible, and demonstrates very well how often conditions are overlooked unless examinations are made especially for them.

**A Salt-free Diet in the Treatment of Actinomycosis.** The results obtained from iodide of potassium in the treatment of certain of the pathogenic fungi are well known, but there are certain cases, particularly of actinomycosis, which even in large doses resist this drug, and, in some of these cases, Pinow<sup>1</sup> noted that there was a slight edema. With the view of lessening the edema, his patients were placed upon a salt-free diet and deep openings were made over the edematous areas with a thermocautery. The first case in which this method was used was that of a young girl, aged fifteen years, who, when admitted to the hospital, had a large red indurated mass in the region of the left breast, in which there were a number of openings which discharged the characteristic sulphur granules. She also had the large retromaxillary lymph nodes, and edema in the region of the lesion, as well as about the eyes. The patient was placed upon iodide of potassium, in daily doses of about 6 grams. Instead of improving, the patient grew worse, and the edema increased. Under the salt-free diet, in five days' time there was a considerable improvement, the edema having diminished markedly. The potassium iodide was continued and syrup of ferrous iodide was given; in two months' time the lesion had entirely disappeared. Subsequently, another case was treated in the same way, also with very favorable results. In cases in which it is desired to increase the action of the iodides, it might be well to try the combination of the drug and a salt-free diet.

**Radiotherapy in Actinomycosis.** There are certain cases of actinomycosis which are not benefited greatly by the use of potassium iodide

<sup>1</sup> La Semaine Médicale, November 5, 1913.



and in which, owing to the location, surgical operations are either not possible or not curative. Levy<sup>1</sup> has reported a case involving the jaw and tongue in which further surgical intervention was not deemed expedient. Under the influence of the *x*-rays, the infiltration gradually disappeared, and the fistulas closed. The cure was apparently complete, and the patient remained perfectly well after a period of six months. This method of treating actinomycosis ought to lead to the cure, or at any rate to the cessation, of symptoms in many cases which, up to the present time, have resisted all other forms of treatment.

**The Treatment of Anthrax by Steam.** Guaciardello,<sup>2</sup> one of the Italian surgeons, has suggested a simple method of dealing with anthrax infections. His method consists of using a pot with a cover in which the water may be boiled, and from the cover a pipe 2 c.c. in diameter is so arranged that the outlet may be directed toward any part of the patient. The steam is then allowed to spray over the affected part, the temperature being as hot as the patient can stand it, and the heat can be regulated by the distance of the nozzle from the skin. The degree of heat should be maintained at a temperature as even as possible. The steam is directed toward the lesion and a small zone of skin surrounding it, while the immediate neighborhood is protected by using a pasteboard cover. This cover should not quite touch the skin. Five, six, or seven treatments may be given a day. These may vary in time from about one hour to one hour and a half. Between the treatments, the affected area is covered with the dressings wet with hot water. The effect of the treatment has been very satisfactory. The pain is soon diminished, and the area generally becomes rose color and a small amount of pus is discharged. Later, the suppuration becomes more active, and, each time the compresses are removed, a considerable quantity of pus is found. All washings or sprayings should be stopped, and the treatment should be kept up from two to six days.

**Infection of the Pharynx with *Aspergillus Niger*.** This organism has been frequently noted in the outer ear, and generally this is the only place that it has been observed. The case reported by Conlon<sup>3</sup> is therefore of unusual interest. This patient was a boy, aged eighteen years, who had been treated for chronic catarrhal otitis media. The whole of his pharynx and nasal pharynx was covered with a coal-black, glistening membrane which was quite tough and could be lifted 4 or 5 mm. without rupturing, leaving apparently normal mucous membrane underneath. This membrane was made up almost entirely of the mycelium and spores of the *aspergillus niger*. In spite of rather vigorous treatment, the parasite could be demonstrated for weeks in the secretion of the pharynx. It is stated that pigeons, swans, and fowls generally,

<sup>1</sup> Zentralblatt für Chirurgie, January 25, 1913.

<sup>2</sup> La Semaine Médicale, November 29, 1913, No. 44, p. 524.

<sup>3</sup> Journal of the American Medical Association, March 22, 1913, p. 900.

are frequently infected with this organism and it is interesting to note that Conlon's patient had been engaged in cleaning the hen-coop before the membrane was noted.

**Vaccine Therapy in Chronic Bronchitis.** One of the most difficult conditions to deal with in general practice is chronic bronchitis. When these cases do not yield to ordinary methods of treatment, changes in climate are found to be most advantageous, especially when accompanied by long open-air treatment, but it frequently happens that patients with this distressing affection cannot avail themselves of this method of treatment. Gillett<sup>1</sup> is of the opinion that a vaccine treatment may be used in these cases to advantage, and he has reported 8 chronic cases. He used only autogenous vaccines, with one exception. It is quite probable, however, that stock vaccines may be just as useful in many cases. The sputum was collected, so far as possible, aseptically, boiled water was used for brushing the teeth and rinsing the mouth, a little also was gargled and swallowed. The expectoration next after this was used and a little of the sputum was washed and shaken up with sterile salt solution and one or two loopfuls of agar, Pfeiffer's agar and nasgar. The vaccine was made from the growth after fifteen to thirty-six hours, the cultures as they occurred being used in salt solution without making any subcultures, as it is thought that the subcultures lessen the value of the organism for vaccines, and that also the combination of organisms secured from the sputum can be used to advantage in the treatment. Where failure occurs in the treatment, the question of dosage should always be carefully considered as well as the proportion of the vaccine. One should make sure that the micro-organism used is the cause of the trouble and also whether there is only one organism or whether a group which may be acting together. Sterilization should not be too prolonged. All of Gillett's cases eventually recovered, most of them after a comparatively short period of time.

**Diphtheria.** THE RECRUDESCENCE OF DIPHTHERIA IN GERMANY. During the past few years there have been several severe outbreaks of diphtheria in Germany which ought to teach one or two things in regard to the disease. The first is that diphtheria has not changed materially of recent years, but is the same deadly disease that it has always been, and perhaps always will be. From year to year the virulence of the disease seems to vary, and this is due to causes which are at present entirely unknown, and in this respect diphtheria does not differ from the other infectious diseases. The modification which has been noted in the mortality rates can be attributed very largely to the use of antidiphtheritic serum, but, to be of any value, it must be injected early, the best results being in cases injected on the first, second, and third day, the earlier the better, and it is better to give a large dose the

<sup>1</sup> British Medical Journal, February 22, 1913.

first time rather than rely upon small, repeated injections. The German authorities are of the opinion that it is more efficient if injected intramuscularly.

**A NEW DIPHTHERIA PROPHYLACTIC.** Theobald Smith, and numerous other investigators, have studied, for some time, the possibility of producing a lasting immunity by using a combination of antitoxin and toxin. Von Behring,<sup>1</sup> Schreiber,<sup>2</sup> and Zangmeister and Viereck<sup>3</sup> have reported upon a mixture suggested by von Behring which has been tested upon children in the clinics of Magdeburg and at Marburg. As a rule, the reactions following the injections were slight or entirely absent, although sometimes a violent reaction occurred. The antitoxin apparently developed rather slowly, and, in the average cases, was quite sufficient for practical purposes, but, when a violent reaction occurred, it was found that very large quantities of antitoxin were present in the blood. In one instance, the blood was withdrawn from the child and the serum injected into another. This method will undoubtedly be eventually brought to a condition in which it may be used for purposes of stamping out diphtheria in certain localities. The objection to using injections of the ordinary antitoxin for protecting children is chiefly the short period of time which the immunity lasts, and also the possibility of producing anaphylactic phenomena.

**A NEW CULTURE MEDIUM FOR THE DIPHTHERIA BACILLUS.** Not very many additions have been made to our knowledge of the diphtheria organism, but von Drigalski and Bierast<sup>4</sup> have suggested a new method of making culture medium. They found that the addition of 3.25 per cent. of beef bile to Loeffler's culture medium had a very favorable effect upon the growth of the diphtheria organism. They add 600 c.c. of beef blood serum to 174 c.c. of bouillon containing 1 per cent. of glucose and 26 c.c. of bile. This mixture is placed in tubes or plates, as desired, and then coagulated at between 90° and 95° C., after which it is sterilized by the fractional method during three consecutive days as is done for ordinary blood serum. In their experience with 98 positive cultures, only 81 were positive when the ordinary culture media were used. Seventeen of the cases could have been regarded as negative if it had not been for the use of the special medium.

**THE TREATMENT OF DIPHTHERIA CARRIERS.** There have been all sorts of suggestions made for freeing diphtheria carriers from the bacilli. Results from the various methods have been outlined by Albert.<sup>5</sup> He suggests that the best results can be obtained by the application of a solution of *silver nitrate*, from 5 per cent. to 10 per cent., applied by means of a thin, flexible applicator, and, in addition to this, the use of a mild alkaline antiseptic spray, such as Seiler's solution for the nose,

<sup>1</sup> Deutsch. med. Woch., No. 19, 1913.

<sup>2</sup> Ibid., 1913, No. 20.

<sup>3</sup> Ibid., 1913, No. 21.

<sup>4</sup> Ibid., June 26, 1913.

<sup>5</sup> Journal of the American Medical Association, September 27, 1913, p. 1027.



and a 1 per cent solution of hydrogen peroxide as a mouth wash and gargle. C. Hampson Jones has found a solution of *iodine* to be effective, particularly what is known as Bolton's solution, a combination of *phenol* and *iodine*. A very important point to remember in considering diphtheria carriers is that many are perfectly harmless, and the organisms apparently are not virulent and will not cause the disease in other individuals. It is rather troublesome to test the virulence of diphtheria bacilli as it requires animal experiments, but, in studies made in former years, it was found that diphtheria carriers who had been in intimate contact with virulent diphtheria cases generally had virulent diphtheria bacilli in their throats, whereas the carrier who had not been in close contact with diphtheria cases, for the most part, had a virulent bacilli in their throats.

A new method of treating diphtheria carriers is suggested by Wood.<sup>1</sup> He advises the use in the nose and throat of a spray of the *lactic acid bacillus*. He uses one- or two-day cultures of agar which is washed off with a sterile normal salt solution, and then washed off with an atomizer. This method was used in but very few cases but these were those in which other methods had proved of no use. Inasmuch as this method seems to be, at least theoretically, less objectionable than the use of staphylococcus sprays, it can be recommended and is well worth investigating.

TONSILLITIS FOLLOWING THE USE OF THE STAPHYLOCOCCUS SPRAY. It has always seemed very curious that the use of the spray of staphylococcus, as is so frequently done for clearing up throats infected with diphtheria bacilli, has not been attended with more cases of acute symptoms of infection with the staphylococcus. It is quite possible that many cases have occurred and have not been reported, and it is also possible that as there is some antagonistic action between the staphylococcus and the diphtheria bacillus, the reverse may also be true. Davis<sup>2</sup> has reported an interesting example of acute tonsillitis following the use of a staphylococcus spray used for the purpose of getting rid of the diphtheria bacilli after a mild case of diphtheria. There was nothing of any special clinical interest in the case except the fact that it was apparently associated directly with the use of a staphylococcus spray.

THE PRESENCE OF THE DIPHTHERIA BACILLUS IN THE URINE. Koch<sup>3</sup> has made some studies upon this subject which has already received a certain amount of investigation at the hands of Conradi and Bierast. These latter authors found that in about one-third of the patients suffering with diphtheria, or convalescing from it, eliminated diphtheria bacilli in the urine, and they believe that this makes plain certain cases in which the source from infection is obscure. Koch

<sup>1</sup> Journal of the American Medical Association, August 9, 1913, p. 394.

<sup>2</sup> Ibid., p. 393.

<sup>3</sup> Deutsch. med. Woch., December 12, 1912.

found that often bacilli of the urine suggesting diphtheria bacilli might readily be mistaken for them. Twenty-six patients were studied in all, and, in 19, the results were negative. Numerous examinations of the same patients were made. The presence of diphtheria bacilli virulent for animals were noted in only 4 specimens of urine coming from 2 patients, and, in both, there was grave generalized intoxication. In 10 other specimens coming from 5 patients, bacilli having the general appearance as those of diphtheria were noted, but they could not be identified beyond question. It would seem, therefore, that as a matter of fact, the presence of the organism in the urine is a thing of extreme rarity and that under ordinary conditions the disease is not spread in this manner, although it is possible that under exceptional circumstances this may be the source of spreading contagion.

Beyer,<sup>1</sup> from studies made to confirm or disprove the above statements, found that, in 19 cases, the bacilli were present in every one, but that they usually became less abundant as soon as the fever disappeared. In 8 cases they were found from four to eight weeks, and in four from thirteen to fourteen weeks after the original infection. In 6 of these cases, inoculations in animals showed that these bacilli were virulent. Beyer believes that the urine is a source of considerable danger in spreading the disease, but, in view of the great differences of opinion and also of the facts in the case as stated by various investigators, one would not like to decide this question until it has been thoroughly restudied by other observers.

**DIPHTHERIA PARALYSIS.** David<sup>2</sup> has made a study of the occurrence of paralysis in the course of diphtheria epidemics, and has come to the conclusion that some epidemics are much more liable to be attended with paralysis than others. In one epidemic observed by him, this extended also to adults, and there were a large number of unusually severe and fatal cases. There were quite a number of cases of paralysis in children who had not had any angina. These were mostly typical diphtheritic paralysis, chiefly of the soft palate, eyelids, ocular muscles, and the like. I have already noted, in *PROGRESSIVE MEDICINE*, a very instructive article by Rolleston which is to be recommended to all who are interested in this subject.

A more recent article by Rolleston<sup>3</sup> gives the results of his observations on 2300 cases of diphtheria. The original series included only 1500 cases. This series is of remarkable interest not only for the facts contained, but for the reason that it is the result of the observations of one man made under exceptional circumstances, for all cases of diphtheria were detained in the hospital for at least six weeks. As it is exceptional for diphtheritic paralysis to develop after that date, except

<sup>1</sup> Munch. med. Woch., February 4, 1913.

<sup>2</sup> Arch. de Méd. des Enfants, February, 1913.

<sup>3</sup> Archives of Pediatrics, May, 1913, p. 335.

in cases which have shown previous signs of nervous involvement, Rolleston's figures may be taken as a very accurate statement of the facts in the case. In the 2300 cases, 477, or 20.7 per cent., showed some form of paralysis; 184 of these were severe, and 85 were fatal. In each series of 100 cases, the percentage of paralysis cases was never less than 10 per cent., or more than 31 per cent. Rolleston believes that the lower percentages noted by other observers are the result of overlooking very mild forms of palsy, particularly nasal, vocal, or cycloplegia. The American Pediatric Society, for example, noted only 9 per cent. of paralysis cases, and Sanné 11 per cent. Rolleston's cases have been classified according to their severity into 6 groups, and the following table shows the relation of paralysis to the character of the initial attack:

A. Faucial cases with or without nasal and laryngeal involvement.

Character of initial attack.	Paralysis.		Percentage.	Severe paralysis cases.	Percentage.
	Cases of all kinds.				
Case 1. Very severe . . . . .	216	153	70.8	104	48.1
" 2. Severe . . . . .	415	193	46.5	65	33.6
" 3. Moderately severe . . . . .	169	39	23.6	3	1.7
" 4. Moderate . . . . .	498	68	13.6	9	1.8
" 5. Mild . . . . .	890	23	2.5		
" 6. Very mild. . . . .	62				
	2250	476		181	

B. Nasal cases only.

Severe . . . . .	1	} No paralysis
Moderate . . . . .	6	
Mild . . . . .	20	
Very mild . . . . .	3	1 case

C. Laryngeal cases only.

Severe . . . . .	11	} No paralysis
Moderate . . . . .	8	
Mild . . . . .	1	

In 216 very severe cases, there were 50 deaths from toxemia before any paralysis developed, so it will be noted that, in these very severe cases, all but 13 of the survivors were affected. There were 107 cases of the most malignant form of diphtheria, sometimes spoken of as hemorrhagic diphtheria. All of those that survived had paralysis of a severe kind. It was also remarked that paralysis was much more frequent and severe in children in which the nose was involved as well as the throat. Thus, in 570 faucial and nasal cases, there were 240 paralysis cases, or 42.1 per cent., 133 of which were severe, as compared with 237 paralysis cases, or 14.1 per cent., 51 of which were severe, among 1680 cases of faucial diphtheria including laryngeal cases but excluding those with nasal involvement. Only one of the purely nasal



cases developed paralysis, and that only a very slight one, and no paralysis followed any of the 20 purely laryngeal cases. Paralysis following pure cutaneous diphtheria has been noted, but none occurred in Rolleston's series. This experience corresponds with that which is generally noted, but, in severe diphtheria with a marked toxemia, paralysis is liable to occur, whereas, in mild cases with little absorption, as in the laryngeal cases or in the slight nasal cases, paralysis is exceedingly rare. Where a wide area is involved, favoring the absorption of the toxemia, as in involvement of both fauces and nose, paralysis is common. Rolleston also studied the deep reflexes in relation to diphtheria, and the knee-jerks and the presence of Babinski's sign is more common in severe than in mild attacks. This is shown in the following table:

	Knee jerks lost.	Tendo-Achillis jerks lost.	Babinski's sign.
Classes I, II, III . . . . .	34.4	27.3	27.9
Class IV . . . . .	11.1	7.6	14.0
Classes V and VI . . . . .	7.2	3.3	9.3

The question of paralysis after relapses and second attacks of diphtheria is of considerable interest. The term relapse in this article means the reappearance of the disease after recovery from the initial attack but before the discharge of the patient from the hospital. The term second attack is applied to cases in which the disease did not occur until after the patient left the hospital. Of the 2300 cases, 31, or 1.3 per cent., had relapses which were separated from the initial attack by periods varying from three to fourteen weeks. Two of the 31 had paralysis of the palate and eye muscles after the first attack, but none showed any paralysis after the relapse. This may be explained possibly by the mild character of the relapses which may be partly due to the prompt administration of antitoxin and partly to the immunity caused by the primary attack of the disease. In this same series, 50, or 2.1 per cent., had second attacks with intervals between the attacks varying between three months and fourteen years. One of the cases had paralysis during the first attack, and 3 had paralysis after their second illness who had previously escaped any nervous involvement and only one case where both attacks followed by paralysis.<sup>1</sup> The relation of the paralysis to the age of the patient is contrary to the teaching of Landouzy. Paralysis, in Rolleston's series, was much more frequent in children than in adults, and the great majority of cases occurred between two and six years, 1066 of the patients being between these ages, and of these, 239, or 22.4 per cent., were paralyzed. The percentage of paralysis cases was slightly greater between the ages of six and ten, but the total number of cases was much less during this period. After eighteen years of age but few paralysis cases were seen, and during

<sup>1</sup> Journal of Nervous and Mental Disease, 1910, vol. xxvii, p. 164.

the first year of life, paralysis is also exceptional. The abolition of the tendon reflexes is also much more common in children than in adults, and the same is true of Babinski's sign. The relation of paralysis to the administration of antitoxin is of extreme interest, and the following table shows the relation of paralysis to the day of the disease on which the antitoxin was injected:

Day of disease.	Total number of cases injected.	Paralysis cases.	Percentage.	Severe forms only.	Percentage.
First day . . . . .	83	3	3.6		
Second day . . . . .	461	65	14.9	18	3.9
Third day . . . . .	541	116	21.4	41	7.5
Fourth day . . . . .	460	124	26.9	46	10.0
Fifth day . . . . .	304	80	26.3	41	13.4
Sixth day . . . . .	166	45	27.1	21	12.6
Seventh day and later . . . . .	215	40	18.6	17	7.9
	2230	273		184	

We noted that the earlier the antitoxin is injected, the much less frequent is the paralysis. It is quite probable that in the pre-antitoxin days there were not as many cases of paralysis as since its use, but this is due to the fact that a very large proportion of cases which formerly died are now saved, and these are the severe cases in which paralysis is apt to occur. *The use of antitoxin, even late, tends to diminish not only the complications of the nervous system but all others as well.* The date of onset and the frequency in each form of paralysis is admirably shown in the following table:

	Palatal.	Ciliary	Squint.	Cardiac.	Labial.	Pharyngeal.	Diaphragmatic.
First week . . . . .	29	..	..	31			
Second week . . . . .	109	..	..	49			
Third week . . . . .	67	8	10	..			
Fourth week . . . . .	40	87	9	..	1	1	1
Fifth week . . . . .	32	91	12	..	8	4	1
Sixth week . . . . .	40	34	11	..	17	14	4
Seventh week . . . . .	14	12	19	..	13	15	3
Eighth week . . . . .	..	4	19	..	10	2	7
	331	236	80	80	49	36	16
Percentage frequency	14.3	10.2	3.4	3.4	2.1	1.1	0.6

During the first two weeks, the only forms of paralysis which occurred were those involving the palate, and the so-called cases of cardiac paralysis. These latter cases could probably be more accurately classified under the heading of vasomotor paralysis. Ocular paralyzes are most apt to occur during the fourth and fifth week, although some occur during the third, and paralysis involving the lips, pharynx, or diaphragm most always occurs late, that is, during the sixth, seventh, or eighth week, although occasionally it is noted as early as the fourth or fifth week. In other words, if the patients go through the first two weeks without

any serious paralytic involvement, nothing of a serious nature need be feared before the fifth week. During the fifth, sixth, seventh and eighth week, very severe forms may make their appearance. The knee- and ankle-jerks are usually lost at an early stage but the superficial reflexes are not abolished until there is a condition of general paralysis.

The duration of the paralysis varies. The paralysis of the palate rarely lasts more than three weeks, with the exception of the cases of early onset in which there is nasal voice, and these may sometimes last for two months or longer. The average duration of the cases coming on very early was 41.19 days, the longest period being eighty-five days, but in the later cases, that is, those coming on after the end of the second week, the average duration was only 17.4 days. Ocular palsies generally last about three weeks. Of 210 cases of ciliary palsy, in which the duration could be fixed, the average period was 21.4 days, and the longest period forty-six days. In 62 cases of squint, the average duration was 18.4 days, the longest period being forty-three days. The average duration of complete paralysis of the pharynx necessitating artificial feeding by nasal or the rectal tube was 11.4 days, the longest period being twenty-two days. Diaphragmatic paralysis is of much shorter duration, the average being 7.8 days, and complete loss of motor power in the legs rarely lasted more than ten days. There are no protracted cases of paralysis in Rolleston's series, although a few chronic cases have been reported by other observers.

The mortality in Rolleston's series was not large. Of the 2300 cases, 171, or 7.4 per cent., died. If 33 cases which died within twenty-four hours of admission are subtracted, the mortality is reduced to 138, or 6.0 per cent. Of these cases, 54 died of toxemia the first few days before paralysis appeared or precocious palatal palsy had time to develop. Nineteen deaths were due to extension of the membrane to the pharynx in 127 tracheotomy cases, Eleven deaths were due to bronchopneumonia, and 2 cases died of scarlet fever, and 1 of congenital syphilis. The remaining 85 deaths were due to paralysis, but in only 5 did the paralysis start after the end of the second week, and all of these were due to paralysis of the diaphragm. In the remaining 80, death was due to cardiac paralysis, the first signs of which had arisen before the beginning of the third week.

The prognosis of diphtheritic paralysis will be seen to depend upon the age of the patient, the date of the onset, and the location of the paralysis. The older the patient, the better the prognosis. There were no fatal cases over the age of thirteen, and no case of paralysis of the pharynx was met with over fourteen, nor of the diaphragm, over eight years of age. The only forms of paralysis which are liable to prove fatal are those involving the vasomotor system and so-called cardiac form, the pharyngeal and the diaphragmatic. The occurrence of paralysis of the palate during the first two weeks is a bad sign; many of



these cases subsequently develop fatal cardiac paralysis, and, in any event, the early palate cases last longer than those which come on early. There was a mortality of 35.2 per cent. in the 141 cases in which precocious palatal paralysis occurred, as compared with a mortality of 1.5 per cent. among 190 cases in which the paralysis first occurred after the end of the first two weeks. Many of the cases of so-called cardiac paralysis are complicated with marked involvement of the liver, due partly to congestion and partly to fatty degeneration. Of 111 cases, that showed any signs of liver involvement, 71, or 63.9 per cent., died, as compared with the mortality of 6.7 per cent., or 130 deaths, among 1920 cases of diphtheria in whom a routine examination of the liver was made. Another very curious observation has been made by Rolleston, and that is that the occurrence of a well-marked serum reaction, occurring at the usual period after the injection, is a favorable sign, and it was found to be very exceptional for the patient to die from cardiac paralysis in whom an urticarial eruption has been well developed.

The treatment of paralysis in these cases requires a word. The early use of antitoxin in sufficient doses is the best means of preventing it. The patient should be at rest in bed for varying periods, depending upon the severity of the case. In mild cases, the patient may be allowed to sit up by the end of the third week, but in severe cases it is well to keep the patient recumbent for six weeks and allow him to sit up then, only if no paralysis has developed. Where paralysis is present, longer periods of rest may be necessary.

**Amebic Dysentery.** THE RELATION OF THE PARASITIC AMEBÆ TO DISEASE. Craig<sup>1</sup> has contributed an interesting article on this subject the details of which need not be gone into. Anyone interested in this subject will find the discussion in which he apparently proves that the *Entamæba coli* is a perfectly harmless parasite in the human intestine, but that *E. histolytica* and *E. tetragena* are pathogenic species capable of producing, in man, the disease known as amebic dysentery.

AMEBIC DYSENTERY AND SALVARSAN. Although emetine bids fair to give extremely satisfactory results in this disease, the observations of Wadham and Hill<sup>2</sup> should not be overlooked. They have reported 3 cases of infection with the ameba and the presence of intense diarrheal symptoms. In all 3 cases, there was a prompt disappearance of the ameba and of the symptoms, and the patients eventually reached a stage of perfect health and continued so. Of course, it is impossible to draw any definite conclusions from only 3 cases, and yet this method of treatment should be borne in mind for cases of amebic dysentery which do not respond promptly to the use of emetine.

<sup>1</sup> American Journal of the Medical Sciences, January, 1913, p. 83.

<sup>2</sup> Journal of the American Medical Association, August 9, 1913.

THE TREATMENT OF AMEBIC DYSENTERY WITH EMETINE. Last year I called attention to the work of Rogers, in India. Since that time this remedy has been tried in America with remarkable success. Allen<sup>1</sup> treated two patients, both of whom were apparently cured. Lyons<sup>2</sup> has used the drug in 6 cases, five of these were apparently cured and one died. In this fatal case there was beginning peritonitis at the time the treatment was begun and the general condition was such that recovery could not be looked for. The average length of treatment in these cases, until the stools became normal, was, nine days for the 5 cases that recovered. The shortest interval was two days, and the longest twenty. The old treatment by use of the internal administration of ipecac has a number of very marked objections, chief of which is the difficulty of administration and the unreliability of the drug as ordinarily marketed. Hydrochloride is a very suitable form of emetine to use, and  $\frac{1}{3}$  grain is about the equivalent of 30 grains of ipecac. The advantages in the use of this drug are the ease and simplicity of administration, the accurate dosing, the repeated absorption and effect, and the fact that it produces no vomiting and depression, and, lastly, the reliability of the drug used. A much longer period of time will have to elapse, and cases will have to be followed to see the outcome, but it is quite possible that this method of treatment will be found to be very efficacious.

Marcos<sup>3</sup> has also had remarkably good results in the treatment of amebic dysentery in cases that had resisted all other forms of treatment. He believes that this treatment will supersede all previous methods that have been in vogue.

EMETINE BY MOUTH IN AMEBIC DYSENTERY. I have already noted the work of Roger in connection with the use of this drug in amebic dysentery, and now Low, one of the lecturers at the London School of Tropical Medicine, comes forward with the statement that the drug is quite as effective when administered by mouth, although his opinion is based on the experience of only 2 cases. The drug is administered in a tablet covered with keratine. Curiously enough, the drug did not cause any nausea in either case.

**Bacillary Dysentery.** THE TREATMENT OF CHRONIC BACILLARY DYSENTERY. The treatment of bacillary dysentery, particularly of chronic forms, is a matter of considerable difficulty. The methods now in vogue do not give results that are always satisfactory. If the acute cases are properly treated, the disease is much less liable to become chronic, but many cases, unfortunately, do persist, to the great discomfort of the patient and, one might say, to the physician as well.

<sup>1</sup> Journal of the American Medical Association, March 1, 1913, p. 664.

<sup>2</sup> American Medical Association, April 19, 1913, p. 1216.

<sup>3</sup> La Clinica Moderna, November 1, 1913, p. 619.

Rogers,<sup>1</sup> who has had an opportunity in observing large numbers of cases of dysentery in India, has contributed an article concerning the advantage of enemas of *silver gelatose*.

In the chronic cases, the saline treatment frequently does more harm than good, and Rogers states that in some hospitals in India the mortality is as much as 40 per cent. In the hands of some observers, the use of dysentery vaccines, prepared from the Shiga bacillus, have given good results, and in most cases the stock vaccines have been employed. More than ordinary caution is required in using these vaccines, owing to the great toxicity of the Shiga bacillus. In some few instances, much better results are obtained by the use of autogenous vaccines, but, for the great majority of cases, these are not available and probably never will be, so that some other methods of treatment must be sought. It is quite probable that sensitized vaccines will yield more specific results than any of the others.

Rogers made a study of the results obtained in over 100 postmortem examinations, and found that, in the fatal cases of acute bacillary dysentery, the whole length of the large intestine and the lowest part of the ileum are uniformly involved in a fibrinous inflammation of the mucous membrane, with only superficial ulcerations, if any. In these acute cases, early death is due to the absorption of large amounts of toxin, aided, perhaps, by the condition of shock caused by the acute affection of such a large extent of the mucous membrane of the bowel. On the other hand, the chronic bacillary dysenteries nearly always have the lesion limited to the lower portions of the large intestine, and, in the cases in which they exceptionally extend above the descending colon, they are comparatively slight in the upper part, although they involve the whole mucous membrane of the lower half of the large bowel, and this is true in cases which have lasted over a month or longer. In those chronic cases, there is extensive ulceration, and the wall of the intestine is generally very much thickened. The patient grows weaker and weaker on account of the frequent losses of blood and the large discharge of mucus. In this stage, various drugs used by the mouth seem to have very little effect over the lesion in the lower part of the bowel. Any drug given by the mouth has a long way to go before it reaches the seat of the disease, and the irritability of the descending colon and sigmoid is so great that everything which reaches this part of the bowel is usually expelled in a very short time. The only drug which has been found of any use at all is large doses of bismuth, but this has not given results that could be regarded as anything like satisfactory. For many years local applications have been suggested, and silver nitrate has been used more than anything else. Unfortunately, both chlorides and albuminous substances precipitate the silver, so that one is never certain how much

<sup>1</sup> British Medical Journal, October 8, 1913, p. 1198.



is actually active when it reaches the diseased surface of the intestine, and, when given in sufficient strength to overcome the above difficulty, it is apt to be attended with a great deal of pain.

Rogers has experimented with various forms of silver in organic combinations, such as have been used for the treatment of inflammatory conditions of the urethra and conjunctiva. The laboratory experiments are of considerable interest. He tried nitrate of silver with the Shiga bacillus in two sets of dilutions, one dissolved in water, and a second in which one and a half of the diluting fluid was sterile broth containing both chlorides and albumins. In the aqueous solution, the dysentery bacillus was killed within five minutes up to a dilution of 1 to 10,000, and yet in the presence of a little broth it failed to kill in the dilution of 1 to 100 in one experiment, and 1 to 500 in another, the silver being precipitated at once by the broth. In laboratory experiments, the action of the organic silver compounds which are not precipitated by broth is much more effective in killing the dysentery bacillus. The one which gave the best results in the laboratory was a silver gelatose (albargin), which, in a broth, killed the Shiga bacillus in five minutes in dilutions of 1 to 500 and 1 to 1000. Nargol and protargol were nearly as active, while argentamine had little action, collargol, ichthargan, and argyrol were practically inert in the presence of broth, as were copper sulphate and cuprol. Mercuriol was active, but Rogers does not think that it would be advisable to use sufficiently large quantities of mercury compounds in the bowel of emaciated subjects. Various other substances which are frequently used as injections were tried, but none of them were anything like as effective as the silver gelatose. Rogers has treated a few cases with this preparation, in both acute and chronic cases, and the results were so satisfactory that he intends to have further experiments made in his ward. In 8 chronic cases, 5 were of from one to four months' duration, one of eight months, and two of sixteen months. One of these patients left the hospital two days after the treatment was begun, so should be excluded. One case was of sixteen months' duration and was considerably improved, but not cured. The remaining six were cured in from 3 to 5 injections. In some cases in which the silver gelatose did not give good results, it was found that there were also pathogenic amebæ in their stools which had not been found on admission. Further studies along this line will of course determine the exact value of this method of treatment which certainly deserves a trial in this vexing class of cases.

**An Echinococcus Cyst of the Pancreas.** Hydatid cysts of the pancreas are extremely rare, and very few cases have been reported. In the literature there were 7 cases, 5 of which were found on the autopsy table. Philips<sup>1</sup> reports a case in a Russian, aged thirty-five, who entered

<sup>1</sup> Journal of the American Medical Association, November 29, 1913. p. 1981.

the hospital at Ancon in the Panama Canal Zone with a characteristic history of duodenal ulcer, symptoms which dated back for a period of nearly seven years. His abdomen was opened under the impression that he had an ulcer, and a large, thickened ulcer of the duodenum was found. There was an inflammatory reaction which extended to the peritoneal coat and caused omental adhesions at the most prominent part. A cystic tumor mass  $2\frac{1}{2}$  by 3 inches was found to the left of the median line and this was found to be in the body of the pancreas, extending from near the head to the tail of the organ. The cyst was found to contain echinococcus hooks, the cavity was lightly curetted and packed, and the patient made an uneventful recovery except for a slight pancreatic fistula which persisted for five weeks.

**The Treatment of Erysipelas in Infants by Means of Vaccines.** The high mortality rate of erysipelas in young infants, and the comparative uselessness of most methods of treatment, add a considerable interest to the report by Sill<sup>1</sup> who has treated a series of 10 cases with only one death. These infants varied from the ages of five to seventeen months, and one was only eight days old. In 7 cases, he used the streptococcus vaccine alone, in one case a mixture of streptococci, staphylococci, and colon bacillus, and two cases with Schaffer's mixed infection phylacogen. A child, eight months of age, with erysipelas of the leg following streptococcus infection, will serve as an example of Sill's method of treatment. Fifty thousand streptococci were given at the first injection, and, in this instance, in three days the temperature reached normal and the inflammation practically disappeared. In cases in which the inflammation has not spread in from twenty-four to forty-eight hours, additional doses of streptococci are given, sometimes eighty million, sometimes one hundred and twenty million as a dose. Considering the gravity of the disease as one ordinarily sees it, the practitioner should lose no time in testing this method of treatment which, if Sill's experience is borne out, ought to make a vast difference in the prognosis of this disease.

**Coccidioidal Granuloma.** This disease is quite a rare one. The first case in California was described by Rixford, and later described in connection with Gilchrist, and still later, in 1905, Ophules, of San Francisco, described the fungus and gave it the name of *Oidium coccidioides*. He reported 13 cases and gave the points to differentiate this fungus from the closely related *Blastomyces coccidioides*. Bowles<sup>2</sup> has reported a nineteenth case in California, and most of the people with the disease have come from the lower half of the San Joaquin Valley. Most of the patients have given histories of bone lesions and skin lesions which consist of tumors which ulcerate and have no tendency to heal, and, later, involvement of the lymph nodes and a termination

<sup>1</sup> Medical Record, March 29, 1913, p. 573.

<sup>2</sup> Journal of the American Medical Association, December 21, 1912, p. 2252.

not unlike tuberculosis. All the cases have died except one in which the first symptoms appeared in the ankle. The leg was amputated before the other lesions developed, and the patient is reported alive and well. The other cases were treated by surgical means and the administration of potassium iodide.

**Foot and Mouth Disease in Man.** This disease very rarely affects man, and it is not very often seen in cattle or domestic animals. In animals, there are fever and a vesicular eruption on the mucous membranes, on the mouth, and on the skin above the hoofs and between the toes. Ulceration follows, with salivation and great tenderness of the affected parts. There is great emaciation, and healing is slow, but the animals usually recover. The disease is transmitted to man through unboiled milk or butter or cheese, and also directly from the saliva and contents of the vesicles gaining entrance through abrasions in the skin. It is most frequently seen in those who work about cattle and in children. A case of this disease has been reported by O'Brien.<sup>1</sup> This case occurred in a veterinary inspector, aged thirty-five years, who was bitten by a sheep on the forefinger of the left hand. An antiseptic dressing was applied and three weeks later what was thought to be an abscess developed and was opened, but no pus escaped and the wound refused to heal. About a month after the finger was bitten, redness and swelling appeared on both hands accompanied by itching of the parts, with a few small, raised white swellings like little lumps under the skin, especially in the clefts of the fingers. By night time there was slight itching of the upper part of both feet, with a prickly sensation of both soles. A few vesicles were observable on the fauces, and on the inside of the lips and gums on the side of tongue, which was swollen and somewhat tender. Speech, deglutition, and mastication were painful, and there was a copious flow of saliva. The following day the vesicles in the mouth became shallow ulcers, and from this time the patient made an uneventful recovery.

**The Conjunctival Reaction for Glanders.** Of recent years, there have been extensive experiments made in various parts of the world with the view to finding a method by which glanders in horses could be quickly diagnosed by the practitioner without waiting for one of the results of the serum tests. Numerous observers, beginning with Vallée and including Martell, Reinhardt, Meissner, and others, have found that local reactions produced by mallein give remarkably sure results in diagnosis. It is well known that mallein, compared with tuberculin, gives a more intense reaction when injected subcutaneously, and, theoretically, it might be expected to yield more valuable results when applied locally by other methods. Meyer<sup>2</sup> made a large series of experiments with only ophthalmic tests for glanders, and found it to be exceed-

<sup>1</sup> British Medical Journal, February 22, 1913, p. 391.

<sup>2</sup> Journal of Infectious Disease, 1913, vol. xii, p. 188.



ingly reliable. The test is made by dropping into the conjunctival sac on the mucous membrane of the lower lid, two drops of a 5 per cent. solution of mallein siccum. The solution must be made thoroughly before use. It is exceedingly interesting to compare this with the observations that have been made in human tuberculosis, and by Austrian in typhoid fever.

**Gapes in Man.** There are, so far as I know, no instances of infection in man by Avian parasitic nematodes so that the observation of Leiper<sup>1</sup> is of unusual interest. He received from Dr. King, of St. Lucia, West Indies, a worm which proved to be *Syngamus trachealis*. This was from a patient, an Irish woman, aged about forty years, who had lived fourteen years in the tropics, who had complained of a slight chronic cough. She had no abnormal physical signs of the chest. One day, being about to cough, she put her handkerchief to her mouth and on taking it away noticed what she took for a streak of blood upon the handkerchief. On further inspection, the streak which seemed to be alive was taken to Dr. King who sent it for examination to the reporter. After the worm was coughed up, the patient's cough almost disappeared. This is a parasite which causes gapes in chickens, and it seems strange that if it is possible of infecting man that it has not been observed prior to this time, as it is a very common disease in chickens, and very close association with the diseased chickens and their keepers almost always occurs. It is quite possible that this is an instance, as Leiper suggests, of deception by an hysterical patient.

**The Etiology of Hodgkin's Disease.** It has been suggested that Hodgkin's disease was an infection of some kind, and Bunting and Yates<sup>2</sup> have recently described a diphtheroid organism obtained from pure cultures in 4 cases of Hodgkin's disease and observed in 3 others. They have attempted to determine the possible relationship between this organism and the disease, and, in a preliminary report, they state that while they do not claim that inoculations of the organism into monkeys (*Macacus rhesus*) have produced Hodgkin's disease, they believe that by repeated injections they have produced a progressive enlargement of a single group of lymph nodes which show histological changes identical with those seen in the lymph nodes of human beings where the disease is of the same duration. Clinically, the animal's blood has shown an absence of polymorphonuclear leukocytosis after the injection of the organism, and there is an increase in the percentage of the mononuclear elements, particularly of the transitionals, and an increase in the eosinophiles following a primary fall, and an early increase in the basophiles, all of which are characteristic of the early stages of Hodgkin's disease. They have designated the organism *Corynebacterium hodgkini*.

<sup>1</sup> Lancet, January 18, 1913.

<sup>2</sup> Journal of the American Medical Association, November 15, 1913, p. 1803.

**Hookworms.** WHAT EVERYONE SHOULD KNOW ABOUT HOOKWORMS. The Florida State Board of Health has issued a pamphlet which is well worth study and reproducing on account of its simplicity. It is titled "What Everyone Should Know About Hookworms," and reads as follows:

1. The largest hookworm is only about three-fourths of an inch long—the male a little smaller.

2. The adult hookworms live in the alimentary tract in human beings.

3. They lay large numbers of eggs in the alimentary tract.

4. These eggs are passed out in the stools.

5. Where sewage is properly disposed of, the eggs are destroyed, and no harm is done.

6. But where no privy is even used, the eggs are deposited on the ground where they hatch, and

7. In a few days the baby hookworms are ready to attack the feet of any barefoot child that chances to come along.

8. This they do by burrowing into the skin, producing what we know as ground itch.

9. They get through the skin into the circulation through which they pass until they reach the lungs.

10. There they are coughed up and swallowed.

11. When they reach the intestines they grow up to be adult hookworms, and the child begins to get pale.

12. This child in turn begins to deposit hookworm eggs as the one before did and so on in an endless cycle.

13. If you suspect your child has hookworm write the State Board of Health.

**THE TREATMENT OF HOOKWORM.** There is no one more competent to speak upon this subject than Stiles,<sup>1</sup> who has made some additional studies on the studies of the best form of medication and whether it is wise to increase the maximum dose of thymol so that patients might, to a reasonable certainty, be treated with one dose in a large majority of cases, or whether it is wiser to continue to use the smaller, repeated doses. The reason for considering the single dose treatment is that some patients will not use repeated doses, and so continue to expel the parasite and continue to be a source of danger to others. The doses which are in use at present may be regarded as entirely safe, and it is questionable whether it would be advisable to take the risk of giving larger doses, the safety of which is still a matter of considerable doubt. The great objection to increasing the dose is the fact that, owing to the carelessness of carrying out the treatment at home, patients are still liable to use castor oil instead of salts. This practice has already resulted

<sup>1</sup> Public Health Reports, January 17, 1913, p. 119.

in not less than eleven deaths in the United States, and, if the maximum dose is increased, the danger from the accidental administration of castor oil would be much greater.

Stiles believes that with the increased use of sanitary privies and with the repetition of the small doses, satisfactory results will be obtained with a greater margin of safety than would be the case with the use of larger quantities of thymol. The present maximum single dose of thymol has been from 15 grains at seven and a half years, 30 grains from twelve to fifteen years, 45 grains from fifteen to twenty years, and 1 dram above that. Where two doses are used, from 5 to 45 grains, according to the age and condition of the patient..

In an article dealing with the thymol administration and particularly calling attention to the subjective effects of the drug, Stiles and Boatwright<sup>1</sup> called attention to another fact which is extremely important in considering hookworm eradication, and that is unless the work is followed by redoubled efforts to improve the sanitation, a considerable part of the effort will result only in temporary benefit. The medical work, that is, the use of thymol and salts, gives excellent results, but, unless reinfection is prevented, this will not avail much in the long run, so that, in all infected areas, the laity should be instructed in sanitary matters. As Stiles very pointedly remarks, "Our interpretation of the present status is, that the laity today has far too much faith in drugs and far too little knowledge of privies."

**Leprosy.** LEPROSY IN THE UNITED STATES. If various reports that occur from time to time in the daily press can be relied upon, the treatment of the leper in the United States, by the public and often by health authorities, suggests not the twentieth century but the middle ages. It is, therefore, of great importance, particularly from the humanitarian standpoint, that the question of what to do with the leper in the United States should be settled once and for all, and it would seem that there is only one rational thing to do, and that is the foundation of a national leper colony to which all cases from all the States could be transferred and where the leper could live his life in company with his kind and not undergo the hardships that grow out of treatment by a populace with little understanding and less feeling. Blue<sup>2</sup> has reviewed the occurrence of the disease in the United States, and just one word of what he has to say may not be out of place. In 1909, so far as could be determined, there were 139 cases located in 13 States and the District of Columbia, 764 in Hawaii, 17 in Porto Rico, 2330 in the Philippine Islands, and 17 in the Canal Zone. These cases were what is called "officially recognized," and it is quite probable that there are numerous others which have not been reported. There is considerable variation in what is done in various States. Many of the States

<sup>1</sup> Public Health Reports, July 8, 1913, p. 1497.

<sup>2</sup> Journal of the American Medical Association, September 20, 1913, p. 943.



have no legislation on the subject whatever, but almost everywhere it is required to report and segregate leprosy. In Minnesota, self-isolation in the home is required. In Louisiana, every known leper is required to become an inmate of the leper home located in Iberville Parish. Colonies are also maintained in Massachusetts and San Francisco. In 1909, Texas appropriated \$40,000 for the leper home, but, on account of opposition of localities to its erection, nothing has been done. There is no question about the desirability of segregating lepers, although the disease is not one which is apt to be contracted except by the most intimate contact. From the standpoint of humanity, expense and efficiency, a national leper colony for the United States would seem to the reviewer to be the only rational way of dealing with the problem.

**THE DANGER OF ASSOCIATION WITH LEPERS.** Leprosy is regarded with such terror by the average individual, and such inhuman methods are employed in dealing with lepers, that it is well to call attention to a report by McCoy and Goodhue.<sup>1</sup> They made a study of the infection at the Hawaiian Leper Settlement at Molokai. The observations deal with adults only. They have divided their observations into two classes, first, relating to "kokuas" or clean persons who have lived with persons usually in conjugal relationship, and secondly, other persons, including members of nursing and religious orders, all of whom lived in less close association with the inmates than did the kokuas. There is no exact English equivalent of this term, but it is used to designate a person who has gone into isolation at the settlement for the purpose of affording aid and companionship to a leper, usually the husband or wife, sometimes another relative, rarely a friend. Of 119 men, practically all Hawaiians, or persons of mixed Hawaiian blood, living in the same house with lepers, only 5, or 4.2 per cent., developed leprosy. Of 106 women, in the same class, living in the same house with lepers, 5, or 4.71 per cent., developed the disease. Of 12 women, all Caucasian, who lived in such contact with lepers as is necessary in administering to their bodily and spiritual needs, none developed the disease, but of 23 men, all Caucasian who lived in similar contact with lepers 3, or 13 per cent., developed the disease. The shortest period in which the disease developed after the person entered the settlement was three years, while the longest was seventeen years. In earlier years it was stated that a very much larger percentage of people associated with lepers developed the disease. It is quite possible that the improved sanitary conditions in which the leper is situated may have lessened the risk of infection. In any event, the disease is one which, while unquestionably communicable, is not so to such a degree as to warrant the uncalled-for harshness that is used in the treatment of leprosy in the United States.

<sup>1</sup> Public Health Bulletin 61, July, 1913.

THE TRANSMISSIBILITY OF THE LEPROSY BACILLUS BY THE BED-BUG. For a number of years those who have been studying the transmissibility of the infectious diseases have attempted to incriminate the bed-bug (*Cimex lectularis*). Among these may be mentioned Sands and Long.<sup>1</sup> Smith, Lynch and Divas<sup>2</sup> have made a study of this question and have published their report, although they have not finished their investigations. Kerr, last year, suggested the bed-bug as a conveyer of leprosy. There is some doubt as to the nature of the chromogenic acid-fast organisms used in the studies under consideration, but the investigators believed them to be true leprosy bacilli, and they enter into a discussion of the morphology and other characteristics of the various cultures of the bacillus of leprosy as found in various laboratories. It will not be necessary to give the details of their experimental work, but, bearing in mind the uncertainty of the pathogenic value of the bacilli employed, it may be stated that they found that bed-bugs can be induced to take up the leprosy bacilli with blood to which the bacilli have been added. For a time, the bacilli increase in size and apparently in number within the bug, but eventually disappear, partly by discharge with fecal matter and partly by disintegration within the bed-bugs. The bacilli have been found in the bugs in the alimentary canal and in the gland as well. Bed-bugs which are fed upon human leprosy subjects may also acquire the bacilli, but this does not happen invariably. Bed-bugs infected in the laboratory, and presumably more certainly and heavily infected than those infected by human beings, may transmit the bacilli through the sucking apparatus to the skin of the animal bitten. Whether the disease is transmitted in this way in nature, and whether the organisms are unchanged and of sufficient virulence to produce leprosy, remains to be proved. The authors, however, believed that, if this is true, it is also probable that there are a number of other insects which might also transmit the disease.

Thomson<sup>3</sup> noted the work of Sands and Long, mentioned above, in which they claim to have found that a large percentage of the bed-bugs caught within the dwellings of lepers contained acid-fast bacilli, while those caught in the dwellings of healthy people contained none. In 1911, Thomson began feeding a number of bed-bugs on two leprosy cases. One was a case of a maculo-anesthetic type. The other was of a nodular variety. Seventeen bugs were fed directly on the nodules of the latter case and four on the patches of the former. They were killed and examined from two to ten days afterward for acid-fast bacilli, but none could be found. A large number of control bugs were also examined, but with negative results. In 1912, Thomson spent three months in Panama, and continues his experiments in the

<sup>1</sup> British Medical Journal, 1911, vol. ii, p. 469-470.

<sup>2</sup> American Journal of the Medical Sciences, November, 1913.

<sup>3</sup> British Medical Journal, October 4, 1913, p. 819.

Paloseco Leper Asylum. Eighty-four bed-bugs were fed on various cases of acute and chronic lepers. Examination of these bugs afterward did not reveal any trace of acid-fast bacilli in the bodies of the insects. Seventeen bugs were all caught in the beds of the patients, and 18 more were caught on the mattresses of the beds in the leper asylum in Trinidad. All of these bugs were examined, and not one showed any trace of acid-fast bacilli. One hundred and seven control bugs were examined. Part of these were taken from dwellings in Liverpool, and the remainder were caught in the Spanish wards of the Ancon Hospital in Panama. The controls were also negative. Thomson's results are very interesting in view of the fact that Smith, Lynch and Divas found acid-fast bacilli in the bodies of certain of the bugs fed upon human leprosy subjects. The subject is one which ought to be settled immediately, and it ought to prove a very fruitful source of investigation. If the bed-bug is actually found to transmit the disease in nature, it furnishes valuable means of combating the disease. If the bed-bug is not responsible for the transmission of the disease, this also ought to be demonstrated as soon as possible.

**LEPROSY BACILLUS IN THE CIRCULATING BLOOD.** Special attention has been paid of recent years to the study of blood with reference to the presence of disease-producing bacteria, and many of the infections which formerly were supposed to be local have been found in reality to be general. Rabinowitch<sup>1</sup> made a study of 9 cases of leprosy, and found that, of the cases that were repeatedly examined, in 3 the bacilli could be demonstrated every time, in one patient not at all, and in four others they were found only once. In two patients that were examined only once, the organism was found, and it was also found in the heart blood of a fetus born of a leprosy mother. He believes that leprosy being a chronic infection is a general infection, and that the leprosy bacillus circulates in the blood stream and that it can be transferred from the mother to the child during intra-uterine life.

**Malaria.** **THE ETIOLOGY OF RELAPSE IN MALARIAL INFECTIONS.** James<sup>2</sup> has made an extensive study of this subject, most of his work being done in the Panama Canal Zone. Relapse in malaria is very commonly observed, and bears a relation to the asexual cycle of the malarial parasite. When the relapse occurs after the so-called spontaneous cure of malaria, it is found that the asexual cycle in such an instance often persists and a considerable number can be detected if the "thick film" method is employed in examining the blood. When the relapse occurs after small doses of quinine which are insufficient to cure the disease, it is probable that the asexual cycle persists in the spleen and in the marrow, and that it is very slightly, if at all, affected by the drug. When the disease is vigorously and promptly treated,

<sup>1</sup> Berliner klinische Wochenschrift, February 10, 1913, p. 252.

<sup>2</sup> Journal of Infectious Diseases, 1913, vol. xii, p. 277.



relapse is less liable to occur, as the quinine is more apt to be effective in early infection than later on when the asexual cycle becomes quite resistant to the drug. If relapse occurs during the administration of quinine by the mouth in what ought to be sufficient doses, the method of administration should be changed, as the return of the disease is undoubtedly due to faulty absorption of the drug. All of these facts point to the truth of the hypothesis that the relapse is due to the asexual cycle, and there is a practical lesson to be learned in that quinine by the mouth, or in small doses, does not eradicate the asexual cycle in the marrow and spleen, and that the parasites, so left, become more or less immune to the effects of quinine, and also that the longer the asexual cycle persists, the easier it acquires an immunity to the drug. Small doses of quinine, even in the mildest infection, may serve only to render the asexual cycle relatively immune. Large doses given early will prove effective, whereas when these large doses are used late in the disease, after small doses have been tried, they will not be effective for reasons stated above. In the Canal Zone, for some years, a routine treatment of 20 grains of quinine on diagnosis, and 10 grains three times a day for at least 10 days were used. This, while reasonably effective, was not always so, and was apt to fail among the more poorly nourished European laborers. Subsequently, this dosage was increased to 45 grains a day, in doses of 15 grains each, and this practically eradicated recurrent malaria among the American and, to a large extent, among the European laborers. The latter, however, often treated themselves with small doses of quinine, and so produced an asexual cycle of parasites that were relatively immune to quinine and so difficult to cure.

THE CULTIVATION OF MALARIAL PARASITES. Last year, I noted the work of Bass and Johns, who succeeded in cultivating the malarial organism *in vitro*. Since then, Thomson and Sinton<sup>1</sup> have succeeded in growing the human trypanosome, and they apparently obtained the same development that takes place in the stomach of the tsetse fly. The malarial parasite, up to date, has only been grown in the asexual generation. One of the latest contributions on the subject is by J. G. and D. Thomson.<sup>2</sup> They have succeeded in growing both the malignant and the benign tertian parasite, using the method of Bass and Johns. In one instance, they had succeeded in producing four complete generations in one parasite in one tube, and they do not see any reason why this growth should not be continued indefinitely, provided suitable conditions are maintained. They noted the difference between benign and malignant parasites in which there was no tendency to clumping of the former, either before or during sporulation. They believe that this clumping of the malignant tertian organism is what prevents the

<sup>1</sup> Annals of Tropical Medicine and Parasitology, 1912, vol. vi, p. 331.

<sup>2</sup> Proceedings of the Royal Society of London, 1913, vol. lxxvii, p. 77.

larger forms from getting into the circulation, and that it is a well-known clinical fact that only the young forms are found in the peripheral blood. The morphology of the two species that have been grown, the *Plasmodium falciparum* and the *P. vivax*, is identical with the species as found in the human host.

**THE DIAGNOSIS OF LATENT MALARIA.** From a study of 464 adult cases of natives in India, Acton and Knolles<sup>1</sup> have drawn some conclusions concerning the presence of urobilin in the urine as a sign of latent malaria. The presence of urobilinuria is evidence of destruction of the hemoglobin which may be due to the alteration in the red-blood corpuscles caused by the malarial parasite. If the patient at the time of the examination is without fever he is in, what Acton and Knolles call, the latent period of malaria. The absence of urobilin in the urine may have a double significance. It may mean that there is no hemolysis, or it may mean that the liver is still capable of accomplishing the extra work imposed on it in the destruction of hemoglobin. When there is no urobilin present, the authors suggest certain other signs, such as a marked leukopenia and a relative increase in the number of the mononuclear cells. These signs may be of considerable value in cases in which the diagnosis is in doubt, and serves a basis for the treatment of a certain number of patients in whom the parasites cannot be demonstrated in the blood.

*The Ross Thick Film Method in the Diagnosis of Malaria.* Anyone who has had much experience in the diagnosis of malaria realizes that there are a great many cases in which the malarial parasite cannot be demonstrated, and sometimes this is due to the patient having taken quinine before the examination is made, but at other times due to the comparatively small number of parasites present. In order to reduce the work of the examination, Ross has suggested a method which is generally known by his name. James<sup>2</sup> has used this method extensively, and gives the following account of the technique which will be found of interest to all workers in malaria:

*The Technique.* I give this in detail and at length for there are many points in it that I found only after much experimentation and practice.

1. A drop of blood, larger than that which, when smeared, would cover the larger part of the usual glass slide, is placed on the slide and spread until it makes a circle about three-quarters of an inch in diameter. I always make two such smears, one on each end of the slide, for reasons that I shall explain later. I use a platinum loop, such as is used in smearing sputum, but the smear can be made with a pin or with a concave surface of a pen. Care should be taken to spread the film as evenly as possible. The slide is then placed on a flat surface, so the blood will not run, and allowed to dry.

<sup>1</sup> Indian Journal of Medical Research, 1913, vol. i, p. 1.

<sup>2</sup> Proceedings of the Canal Zone Medical Association, part 1, p. 49.

If specimens are taken from more than one patient, the slides should be marked with a grease pencil on the reverse side. When the films are dry, the number, or other mark of identification, is scratched on the film with a pin or a pen, and the pencil mark carefully wiped from the other side, otherwise the aniline dye in the mark may dissolve in the acid alcohol used in the next step and so discolor the film.

2. To 50 c.c. of ethyl alcohol of the usual commercial type, ten drops of commercial hydrochloric acid are added. This amount can be lessened or increased according to the strength of the acid. The slides are placed in the solution and kept there until the hemoglobin is dissolved out of the film. This takes from ten to twenty minutes, depending on the thickness of the film, but the slides may be kept in the solution for several hours or overnight without damage to the film. When decolorization is complete, the film loses all of its brown color, and appears grayish white, resembling in appearance ground glass. The acid alcohol, if placed after use in a tightly stoppered bottle, can be used many times, and, if economy is necessary, can be redistilled and used again.

3. The films are now fixed to the slide, and can be handled with ordinary care without fear of their coming off the slides. They are next washed in running tap water for ten or fifteen minutes. They are in no way injured by much longer washing, but the time given is sufficient. This washing is very important, and must be done thoroughly, for if any trace of acid remains in the films, the parasites will not stain.

4. After washing, the films are dried, either in the air or by blotting. Heat must not be used. They are then stained with any good modification of the Romanowski stain, such as Hastings', Wright's, or Leishman's. The undiluted stain must be kept on longer than on the usual slide or cover-glass preparation, in order to give it time to penetrate the thickness of the film. I use a liberal quantity of stain, allow it to remain for two or three minutes, and then dilute with all the water the slide will hold. For the dilution, distilled water only should be used. After a few minutes it is well to dilute again, and in five minutes more to make a third dilution. This is to allow for the loss caused by evaporation, and to keep the stain from precipitating. Two glass rods across a tin or enameled basin makes an excellent staining apparatus, which has the advantage that when the excess of water is added, only a few drops of diluted stain flow from the slide, instead of all the stain coming off, which is the case if the slide be placed on a flat surface. The film that forms on the surface of the diluted stain should be kept well broken by the addition of water. When staining is completed, the films are washed in tap water until no more blue color comes from them. One should be careful not to overdo this last step.

If this technique has been carefully followed, the field will appear as a more or less dark pink against the blue of the cytoplasm of the



parasite, and the red of the chromatin, show quite as plainly as in the usual preparation. The small ring-forms of the parasites are seen from many angles and sometimes only the chromatin dot and a small quantity of the cytoplasm are visible. The larger tertian parasites appear as ragged masses of blue, in which the red of the chromatin can be made out. These are the most difficult of all to identify. Crescents are usually shrunk but are easily recognized by the appearance of pigment and chromatin in their bodies. Sometimes they are undergoing the changes seen in moist chamber preparations and appear as round or ovoid bodies, but the pigment and chromatin make the detection of these forms not difficult. Tertian gametes are very distinctive and are readily recognized. The quartan parasites are very compact, the cytoplasm takes a dark blue, and, when once seen, the older forms are easily recognized. Presegmenting and segmenting parasites offer no difficulty of determination.

**Malta Fever and its Diagnosis.** Since the introduction of Malta fever in the United States it has been observed particularly in people who work about goats. The diagnosis of this disease becomes a matter of considerable importance to us, and the contribution by Mohler and Eichhorn<sup>1</sup> is of interest inasmuch as they show that the agglutination test is not always reliable for diagnosis. They are of the opinion that the complement fixation test can be utilized to great advantage in studying Malta fever, particularly in goats, and, where the disease is found, this enables one to determine its extent and to safeguard against it. As is well known, the disease in the goat may not affect its health, while taking milk from the infected animal may cause the disease in man. Malta fever is usually mild, but has a mortality of about 3 per cent., and also has the great disadvantage of incapacitating the individual for a considerable period.

**Measles.** THE ERUPTION OF MEASLES. A valuable contribution on this subject has been made by von Pirquet.<sup>2</sup> He directs attention to the spread of the rash, which generally goes from one part of the body to another in a more or less definite order, beginning just behind the ears, along the margins of the hair, or sometimes in the upper part of the back, or about the cheeks or forehead, and exceptionally on other parts of the body. From these places, the rash spreads rapidly over the head and back, and much less abundantly on the chest, abdomen, shoulders, and insides of the arm. By the end of the first twenty-four hours there may be a few scattered papules on the other parts of the body. During the next forty-eight hours, the shoulders, chest, abdomen, the front parts of the arm above the elbow, and the thighs are involved, and there is some rash on the back of the arms, on the forearms and on the dorsal surfaces of the thighs. During the next two days the rash

<sup>1</sup> Circular 215, Bureau of Animal Industry, U. S. Dept. of Agriculture.

<sup>2</sup> *Zeitschrift für Kinderheilkunde*, 1913, vol. vi, p. 1.

involves the remainder of the body. It often happens that the elbows, hands, buttocks, and feet are not involved, or only very sparingly so. There are certain variations in that the rash is not so complete in younger children as it is in older ones, that it develops more rapidly in summer than in winter, and that local irritation hastens the eruption, so that inflamed areas of skin may be affected very early. Irritants, applied to the skin just before or just after the rash develops, influences the development of it greatly; it was observed that children infected from the same source of contagion usually have rashes of a similar type, and the same is true of members of the same family. It seems that the spreading of the rash depends upon the amount of blood in the areas involved. Where the blood supply is abundant, the rash appears early and is more intense. von Pirquet suggests that this is due to a reaction with the virus in the capillaries of the skin, possibly the agglutination of the measles organism by antibodies, and, as the antibodies are present in the blood, the more blood in any part of the skin the more antibodies there will be present. In this way most of the virus may be taken out of the blood so that it requires further development of it to affect other parts of the body. This is an original and interesting way of looking at the rash of measles.

**THROMBOSIS FORMATION IN MEASLES.** There have been comparatively few pathological studies made on measles. Lutz<sup>1</sup> had an opportunity of making examination upon 22 fatal cases of measles; in 6 cases he found thrombosis of the pulmonary arteries, and, in 2 cases, in the portal vein. The question is at once raised whether these cases were a primary thrombosis or whether they followed an embolism, but there was no clinical evidence that there was any sudden closing of the vessels. From a pathological standpoint, it would seem that the plugs in the vessels, even in the finest branches of the arteries, were uniform and apparently all formed at the same time. There were no gross changes in the bloodvessels, but the heart was nearly always dilated, and, in 2 cases, there was a marked myocarditis; in 2 cases it is possible that the thrombosis began in the heart. Most of the cases showed a gram-positive diplococcus and streptococcus in cultures made from the heart. In measles there is probably sometimes an increased tendency to coagulation, just as there is in other infectious diseases, and thrombosis is not an uncommon occurrence, but thrombosis of the pulmonary arteries is extremely rare occurrence and, curiously enough, thrombosis in measles has not been noted very many times. Henoch, in 89 autopsies on cases of measles, does not mention a single case in which there was thrombosis. Lasker, in his study on thrombosis in the course of acute infectious diseases, describes a case in which there was thrombus of the pulmonary artery and Robin describes a similar case. Both of these

<sup>1</sup> Berliner klinische Wochenschrift, August 5, 1913, p. 1566.

were regarded as primary thrombosis. Halff has also described 2 cases very much of the same nature. Sometimes thrombosis may be in other parts of the body, and the cerebral sinuses may be affected. Kolb has described a case in which the abdominal aorta was the site of thrombus which extended into the left iliac artery and down into the vessels of the left leg. Barlow refers to a case of Bellani which followed measles, and in which there was a symmetrical gangrene of both legs which was probably due to thrombus, and there have been a number of other cases reported in which children have had thrombosis of vessels of the legs sometimes followed by gangrene. Munk has described the case of a child, three weeks old, in which, three weeks after an attack of measles, gangrene of one of the fingers of the left hand appeared. Gangrene as a complication of measles is a well-known clinical finding, and part of the cases are evidently due to thrombosis and part are apparently due to changes which have been described under the heading of noma, and the exact cause of this is not at all clear.

**Cerebrospinal Fever.** The Dallas epidemic of cerebrospinal fever furnished an occasion for studying the disease such as has not been presented in this country for some years, and a number of well-trained pathologists took advantage of the opportunity. Thayer,<sup>1</sup> of the University of Alabama, has recorded some of his personal observations, several of which are of considerable interest. In the first place, he believes that the disease is a bacteremia probably from the very first, and in every case. He came to this conclusion from the fact that there was such early involvement of deep-seated tissues from which the recovery in pure culture of the organism was a matter of great ease. He believes that the path of entry into the cerebrospinal cavity is probably along the lymph passages which connect it with the upper respiratory tract, and through the beginning of the same lymphatics and their cervical connections the way is quite open for the general infection of the blood current. It is possible that the systemic infection may come later, after the spinal lesions are well developed, but the probability of absorption of anything from the spinal canal after it is the seat of the copious exudate is not very great. Thayer believes that there are three great sources of danger: first, the patient himself; second, the carrier; and third, animals, particularly the larger domestic animals. Even a year before the Dallas outbreak there were two animals on a farm three miles from the city which died of blind staggers, and about the same time, or a little later, three of the children of the family became ill. Two died, and the third one, brought to the hospital in Dallas, was recognized as a case of cerebrospinal fever. There are also numerous reports of horses, cows, and mules being infected throughout northern Texas and Oklahoma. Thayer was able to find a diplo-

<sup>1</sup> Southern Medical Journal, February, 1913.



coccus which, in morphology, staining, and cultural characters, resembled the meningococcus of human cases. The patient may be controlled by isolation; individuals that come within three feet of him may be regarded as suspects, and, if cultures of the nose and throat are positive, some effort should be made to free the air passages of the meningococcus; for this, Thayer suggests the use of 3 grains of camphor, thymol, and menthol rubbed thoroughly together, and then rubbed up in one ounce of liquid albolene. It is important that the three solids be rubbed well together first until they make a liquid, before it is added to the oil. This should be used freely in the nose and throat four or five times a day, and, in the case of individuals who cannot be trusted to do this, arrangements should be made to have them under some sort of supervision, so that this method of clearing up carriers may be effectively carried out.

He suggests a stain for the examination for the meningococcus consisting of:

Carbolic thionin . . . . .	50
Carbolic fuchsin . . . . .	90
Distilled water . . . . .	250
Glacial acetic acid . . . . .	2

This is flooded on the slide, after passing it through the flame, and allowed to stain in the cold for one minute. The living cocci outside the cells are stained blue. The dead and dying ones are reddish to deep red, nuclei blue, and the cytoplasm light red. The presence of any number of cocci outside the cells is important for prognosis and treatment. If the case is not doing very well, but practically all cocci are in the white cells and their red color shows them to be undergoing digestion, it is not necessary to repeat the injection of the serum, but if, in spite of apparent prognosis, any number are outside of the phagocytes, even with a good clinical picture, more serum should be used.

Thayer suggests the use of vaccine every five to ten days, according to the reaction, and he believes that the use of the vaccine alone has proved valuable in hastening and shortening the convalescence and in decreasing the liability to the complications and sequelæ which are so often a distressing feature of the disease. He used five hundred million at a dose, of a vaccine made from four strains of meningococci.

THE CONTROL OF EPIDEMICS OF CEREBROSPINAL FEVER. The recent outbreaks of this disease make the subject of its prevention of particular interest at this time, and the method of managing an outbreak is briefly outlined by von Esdorf.<sup>1</sup> As soon as there have been a sufficient number of cases to warrant unusual precautions, the health authorities should adopt and enforce an ordinance requiring all cases, or suspected cases, to be reported immediately, not only by physicians, but by the heads

<sup>1</sup> Public Health Reports, May 9, 1913.

of families as well. There should be a special record department established for keeping track of the data thus obtained and other information regarding the occurrence of the disease and its management. The easiest and best method of dealing with the patient is to establish an isolation hospital devoted to the care and treatment of cerebrospinal fever only. This may usually be located in one of the existing hospitals, if such is available, or, if not, in another suitable building, or, in case of the weather not being too inclement, in tents. In case the patient cannot be removed to the hospital, the house should be placarded and quarantined. A sufficient amount of the serum should be obtained promptly and should be used for cases in the hospital and also in those which cannot be brought to the hospital; this serum should be distributed without cost, so that there will be no delay whatever in its use. Medical inspection should be established to investigate all cases of illness occurring in families who are unable to pay for the services of a physician, or who, for other reasons, do not wish to summon one, members of this service should also act as a board of diagnosis and should consist of individuals thoroughly familiar with the symptomatology of the disease and with the technique of making lumbar punctures. A laboratory worker should also be at hand to make prompt examinations of the material obtained from lumbar puncture, and of nose and throat cultures.

Every individual who has come in contact with an individual with cerebrospinal fever should be kept under observation, and this is best done by arranging dispensaries where such individuals must report daily, or oftener, if thought desirable. In this way cultures may be taken, and the nose and throats cleansed by means of some simple antiseptic solution; for this latter purpose, Dobell's solution has been very frequently used. It is absolutely essential that a laboratory service be established immediately under the care of an expert, and both laboratory worker and expert diagnostician should be imported from other places in case of need. The town or locality need not be quarantined as this is practically impossible to carry out and it has been found by actual experience to be of little service. Disinfection need only concern the sputum and nasal secretions from the sick, or from persons who have been in contact with them, and the immediate articles in the sick-room. The germ of the disease dies very quickly after leaving the body, and all that is needed is ventilation and exposure to sunlight where possible. One of the most important features of controlling an epidemic is to limit public gatherings. The less people that come together in unsanitary surroundings, the fewer cases of the disease will develop; this includes theatres, churches, moving picture shows, and all buildings which are not properly ventilated and are allowed to be overcrowded. Overcrowded schools should be closed. Schools which are maintained in modern school buildings with proper ventila-

tion need not be closed, but the children should be under a certain amount of medical inspection. Both schools and churches may be used for teaching individuals about the disease and how to prevent it. For this purpose, circulars of information regarding the disease should be widely distributed, and the following has been suggested as covering the more important items.

The following form for a circular of instruction is suggested:

#### INFORMATION REGARDING PREVENTION OF MENINGITIS.

1. The germ which causes epidemic cerebrospinal meningitis has been found only in the human body.

2. Healthy persons may carry the germ in their nose and throat without ever developing the disease. Such persons are known as carriers. There are about ten carriers to every case of meningitis in an infected locality.

3. The measures for lessening the spread of the germs of this disease are as follows;  
(a) The nose and throat should be kept clean. For this purpose cleansing sprays may be used.

(b) Careful attention to personal hygiene, mainly cleanliness. Avoid chilling of the body and other depressing influences. Dress to meet the changes in weather.

(c) Avoid close contact with persons. Healthy persons who are carriers may innocently transmit the germs, which may be in their nose and throat, by coughing, sneezing, kissing, talking, etc.

(d) Children should not use articles which may have come in contact with the mouths of others, such as pencils, particles of food, drinking cups, handkerchiefs, and the like.

(e) Cleanliness of premises and free ventilation of houses are necessary. The germ of this disease is easily killed when exposed to drying and sunlight. Hence it is important to thoroughly ventilate and expose to sunlight all occupied rooms.

(f) The disease is not carried by clothing, merchandise, etc.

(g) Persons suffering with "colds"—that is, nasal catarrh, sore throat, or coughs—should be careful in the presence of others, and seek early medical attention and relief.

Handkerchiefs wet with discharges from the nose or throat should be disinfected by boiling in water.

**NEW SIGNS IN CEREBROSPINAL FEVER.** Several points of interest in connection with this disease have been brought out in an article by Barnes.<sup>1</sup> His observations deal chiefly with atypical cases, and, in many of these cases, it is interesting to note that cervical opisthotonos was one of the very last signs to develop, but the contraction of the recti and other abdominal muscles was noticeable in all the cases. He also noted the dilatation of pupils which is produced when Kernig's sign was being elicited, and it was also noted in several instances when the head is being flexed upon the chest. Another phenomenon which ought to be of particular interest to clinicians is the fact that he was able to produce the rash in cerebrospinal fever by the use of an electric reflector when the rash could not be brought out in cases of meningitis

<sup>1</sup> Interstate Medical Journal, September, 1913, p. 795.



due to other organisms. In some cases, the rash is influenced by the electric light when warm applications have no effect whatever upon the skin. The use of the electric light in other exanthematous diseases might give results that would help in the diagnosis of difficult or atypical cases.

**DIFFERENTIAL DIAGNOSIS OF CEREBROSPINAL FEVER.** The question of the diagnosis of this disease is always a difficult one, and Du Bois<sup>1</sup> has contributed a short article which is well worthy of careful study. In New York City, he had occasion to make notes on 247 cases reported to the health department. About half of these were reported as cerebrospinal fever and the remainder as meningitis, the kind not designated, or as tuberculous meningitis. The following table shows the final diagnosis of the cases seen, and it will be noted how frequently symptoms suggestive of meningitis are met with in other diseases.

TABLE I.—FINAL DIAGNOSIS OF CASES SEEN.

Diagnosis.	No. of cases.	Condition suggesting meningitis.
Epidemic cerebrospinal meningitis . . . . .	48	
Tuberculous meningitis . . . . .	75	
Infantile paralysis . . . . .	37	
Streptococcus meningitis . . . . .	9	
Pneumococcus meningitis . . . . .	3	
Influenzal meningitis . . . . .	2	
Pneumonia . . . . .	19	
Gastro-enteritis . . . . .	5	
Typhoid . . . . .	3	
Hysteria . . . . .	1	
Acidosis . . . . .	1	Rigidity of neck and Kernig's sign.
Osteomyelitis . . . . .	1	
Simple neurosis . . . . .	1	
Tetany . . . . .	3	
Serous meningitis . . . . .	2	
Schönlein's purpura . . . . .	1	
Eczema . . . . .	1	
Erythema multiforme . . . . .	1	Eruption.
Measles . . . . .	1	
Typhus . . . . .	3	
Syphilis of brain . . . . .	1	
Cerebral endarteritis . . . . .	1	Mental condition.
Miliary tuberculosis . . . . .	1	
Encephalitis . . . . .	1	Palsy.
Peripheral neuritis . . . . .	1	
Internal hydrocephalus . . . . .	1	Bulging fontanelle
Toxic conditions . . . . .	1	Convulsions.
Tetanus . . . . .	1	
Diagnosis uncertain . . . . .	19	
Pericarditis . . . . .	1	
Normal child . . . . .	1	

<sup>1</sup> Journal of the American Medical Association, March 15, 1913.

TABLE II.—CHARACTERISTICS OF SPINAL FLUIDS.

	Pressure.	Amount, c.c.	Appearance.	Cytology.	Bact.	Alb.	Globe.	Animal Inoc.
Normal . . .	Normal.	5-10	Clear.	Very few cells.	Sterile.	±	—	Negative.
Meningismus .	Increased.	10-100	Clear.	Very few cells.	Sterile.	±	—	Negative.
Infantile paralysis	Increased.	20-100	Clear. Sometimes slight fibrin web.	Early polynucleo- sis; later lym- phocytosis up to 95 per cent.; en- dothelial cells.	Sterile.	+++	+++	Negative or pneumonia.
Tuberculous men- ingitis. . .	Increased.	30-120	Clear. Fibrin web.	Lymphocytosis up to 95 per cent.	Tubercle bacilli.	+++++	+++++	Tuberculosis in 4 weeks.
Epidemic cerebro- spinal meningitis	Increased.	5-120	Cloudy	Polynucleosis up to 98 per cent.	Meningococcus.	+++++	+++++	
Meningitis due to other organisms.	Increased.	20-100	Cloudy.	Polynucleosis up to 98 per cent.	Infecting organisms.	+++++	+++++	

The cases of meningitis due to other organisms, such as the streptococcus, pneumococcus and the influenza bacillus, can not be told without a lumbar puncture. One of the principal causes of error is infantile paralysis. The fever is higher in infantile paralysis and cerebrospinal fever than in tuberculous meningitis. In infantile paralysis, it usually is high for a short time and falls by lysis. In cerebrospinal fever, the temperature is always very irregular. The history of the onset of the disease is important. In cerebrospinal fever and infantile paralysis there is usually, though not always, a sudden onset, while in tuberculous meningitis the disease begins more gradually. The mental condition is usually more or less good in cerebrospinal fever, except in the fulminating cases. In tuberculous meningitis, there is often a history of irritability followed by increasing stupor from which it is often impossible to arouse the child. In infantile paralysis, the patient is often stuporous, but can be aroused and made to answer intelligently.

The rigidity of the neck may furnish valuable information. In cerebrospinal fever, it is marked, while in tuberculous patients it is apt to be slight or moderate in the anteroposterior direction, with none laterally. The rigidity of the muscles in cerebrospinal fever may be very slight, and DuBois has not found Kernig's sign of much value. Contrary to the opinion of most clinicians, he found MacEwen's sign of some use. This sign is a change from the normal in the percussion note over the lateral ventricles, the change being due to increased intraventricular pressure. It is possible that the comparative uselessness of this sign in the hands of the average physician is his ignorance of the normal and abnormal percussion notes of the head.

DuBois also found Brundiski's sign of use. This consists in flexion and version of the legs and arms when an attempt is made to flex the head on the chest, and the drawing up of one leg when the other is passively flexed. The diagnosis must eventually rest on the characteristics of spinal fluids which are briefly shown in table II.

EPIDEMIC MENINGITIS IN CHILDREN UNDER TWO YEARS OF AGE. The diagnosis and treatment of cerebrospinal fever in children under two years of age is a matter of great importance and great difficulty. In older children, in which the diagnosis is much more easily made and the early treatment more satisfactory, the problem is not such a serious one. Under two years of age, however, meningitis is a disease whose symptomatology is not always clear cut, and very often the diagnosis is not made at all or only a short time before death, and much too late to be of any service from the standpoint of treatment.

The only positive method is to make a *lumbar puncture*, and to examine the cerebrospinal fluid. This is not done as often as it should be, owing to the fact that after one has tapped a number of infants presenting symptoms suggesting meningitis and found a perfectly clear and negative



fluid, one hesitates to do a lumbar puncture, particularly under circumstances of general practice in which the operation may be criticised by the family and in many cases consented to with great reluctance. There are so many diseases which have symptoms suggesting meningitis, and I might mention particularly pneumonia, otitis media, intestinal disturbances, and the onset of almost any of the infectious diseases of childhood. Unfortunately, delay in early infancy means the loss of time which may mean the difference between the child's living and dying. The most important symptoms are high fever, persistence of cerebral symptoms, and MacEwen's percussion note over the frontal parietal junction. Koplik<sup>1</sup> has reviewed his experiences with infants, and he has had 15 cases below one year of age, with a mortality of 10, or 66 per cent. Of these 15 patients, two, injected on the fifth day, recovered; one, injected on the seventeenth day, improved; one, injected on the twenty-first day, was cured; and one, injected on the twenty-seventh day, was cured. Of the remaining patients, none were seen before the second week of the disease, and some not before the forty-second day. In Flexner's series of cases, there were 125 infants below one year of age. Sixty-three recovered, and 62 died, a gross mortality of 50 per cent. The recovery is very much better in the cases in which the serum was used early; 5 infants injected with Flexner's serum in the first three days recovered, and of 16 patients injected in the first week, 12 recovered, or 75 per cent., so that the first lesson to learn is the value of early diagnosis and treatment. Koplik believes that the temperature is a good guide as to the necessity of giving more serum; if there is great restlessness and a normal temperature, he advises examination of the cerebrospinal fluid and, if bacteria are found in a cloudy serum, he advises injection of more serum without waiting for cultures.

ACCIDENTS FOLLOWING THE SUBDURAL INJECTION OF ANTIMENINGITIS SERUM. Judging from the reports published in this country and abroad, since the introduction of antimeningitis serum in 1906, there has been a reduction in the mortality caused by cerebrospinal fever of from two-thirds to three-fourths of the average percentages occurring in the same periods and places among the patients who have not been treated with the serum. Flexner<sup>2</sup> has considered the serious results which have occasionally followed the subdural injection of the serum. The ordinary forms of serum diseases, which are relatively unimportant, were not considered. The severe cases have, curiously enough, not been reported by some physicians who have had a large experience with the serum, while, on the other hand, many cases have been reported by other physicians. Four explanations have been offered: (1) Anaphylaxis; (2) rapid lysis of the meningococci; (3) excessive intracranial pressure;

<sup>1</sup> Journal of the American Medical Association, June 7, 1913, p. 1755.

<sup>2</sup> Ibid., June 21, 1913, p. 1937.

(4) poisoning by the phenol preservative sometimes present in the serum. The last explanation, Flexner does not believe is tenable, owing to the fact that the serum prepared by Dopter, at the Pasteur Institute, in Paris, is prepared without phenol, and yet the same accidents have followed its use. Certain of the cases which have followed the use of several injections of the serum suggest anaphylaxis, but severe symptoms have also been noted to follow the first injection of the serum. In certain other cases, a severe reaction followed, not on the first, but on the second or third injection, and the serum given at brief intervals. In these cases, anaphylactic shock can be excluded. The poison by lysis of the meningococci apparently occurs in the course of immunization of horses with cultures of the meningococcus, and it has been found that the first intravenous injections are well borne, but, after a certain degree of immunity has been established, the use of further injections directly into the veins produces a severe effect, and sometimes death results a short time after the inoculation. Dopter explains this phenomenon on the supposition that the immune animal possesses the power of rapidly dissolving the meningococci, therefore a large amount of dissolved toxin is set free, and the animal dies of an acute poisoning. Flexner does not believe that this explanation is adequate for most of the instances observed in man. He does believe that there is a close relationship between the effects of increased intracranial tension and the serious symptoms which sometimes arise on the injection of the serum.

Koplik early advised the injection of the serum by gravity, which permits of the immediate withdrawal of the fluid at the first sign of any trouble, and, later, Sophian introduced the use of the sphygmomanometer as a control to the injection of the serum by the gravity method. In Sophian's experience of some 1500 injections, there was not a single serious accident.

The lesson which we learn from this consideration is that injections made into the subdural cavity should always be carefully controlled, and should always be made very slowly. In my own experience, which has not been particularly large, I have never seen any untoward symptoms develop from the use of the serum, but in every case it was given slowly.

THE TREATMENT OF MENINGITIS BY DRAINAGE OF THE CISTERNA MAGNA. Hayes<sup>1</sup> has contributed a paper on the surgical treatment of meningitis. This is not the first attempt to apply surgical principles to the treatment of infection of the meninges, and Haynes, in spite of the results of his operation, seems to believe that it will eventually be of service. He quotes the observation of Kopetzky that there is a disappearance of sugar from the cerebrospinal fluid in bacterial

<sup>1</sup> Archives of Pediatrics, February, 1913.

infections affecting the meninges, and that, in cases simulating meningitis but not caused by infection and which did not eventually result in meningitis, sugar did not disappear from the cerebrospinal fluid. Haynes, therefore, believes that if the first examination of the cerebrospinal fluid shows the loss of the copper-reducing agent, even if the cause of the trouble is not discovered at this time, surgical intervention should be undertaken without delay, except in the cases in which the fluid contains the meningococcus, when he believes that the antimeningitis serum should be given, and, if improvement does not follow within twenty-four hours, he then advises operative interference. He believes in having free, continuous drainage for the excess of cerebrospinal fluid. He believes that the best results will be obtained by opening the cisterna magna, which lies close beneath the occipital bone, and which may be reached without difficulty. This relieves the intracranial pressure and restores the normal blood supply to the vital centres. Care should be taken to avoid corking up of the foramen magna by the downward displacement of the brain, and to prevent shock and sudden death of the patient from too rapid escape of the cerebrospinal fluid. The foramen of Magendie may be inspected, and, if it is closed, it may be reopened. Haynes gives the detail of his operation, which need not be noted here. All of Haynes' cases died, but he believes that this was because the operative procedures were instituted too late. It would seem much better therapeutics to attempt to determine the type of organism present and to try more thoroughly the various serums that are now being made. We have, at present, a reasonably efficient antimeningococic serum, and an anti-influenzal serum has been given an extensive trial under the supervision of the Rockefeller Institute. In the septic cases, this method might be of some avail, and, owing to the uniformly fatal results, septic meningitis with any method of treatment will certainly do no harm, but the whole question of operation in these cases affords so many difficulties and requires so much technical skill that it is not a thing to recommend indiscriminately.

**PNEUMOCOCCUS MENINGITIS.** Since the introduction of lumbar puncture and since the use of more exact bacteriological methods there have been very extensive additions made to our knowledge of the cause of meningitis. A very interesting article on this subject is one by Voisin and Stévenin.<sup>1</sup> The pneumococcus infection causing meningitis has been observed in all ages, and it is perhaps more frequent in adults. It is not infrequently an invader after some previous lesion in the nervous tissue, such as tumors, hemorrhage, and the like. The various clinical classes consist first of meningitis occurring in the course of lobar or bronchopneumonia which has been noted in about 8 per cent. of the

<sup>1</sup> Gazette des Hôpitaux, January 4, 1913, No. 1, p. 5.



cases. The second class consists of meningitis due to pneumococcus secondary to other diseases; about one-fourth of these are secondary to otitis. Infections of the sinuses and of the eye precede a certain number, and some cases are observed in connection with infections at a distance, such as puerperal infections, appendicitis, abscesses, and the like. It has also been observed in the course of typhoid fever, influenza, and diphtheria, and it has only been by careful study of the organisms present that this has been so accurately determined. There are, in addition to these cases, a certain number in which the inflammation of the meninges is the only apparent lesion, and there have been epidemics of pneumococcus meningitis reported. The evolution of the disease is shorter than other forms of meningitis, beginning rather suddenly, and these may be marked symptoms at the end of a comparatively few hours. The diagnosis must rest largely on the study of the cerebrospinal fluid and the contained organisms. The fluid as a rule contains a large number of polymorphonuclear leukocytes but occasionally a lymphocytosis is noted. It is also possible to have no increase in the leukocytes whatever. The precipitin reaction has been used by a few observers and is negative for the antimeningococcus serum, but positive with the antipneumococcus serum of Kolle. There have been too few observations made on this latter point, however, to permit one to recommend this as an exclusive method of diagnosis. The treatment is extremely unsatisfactory. Large doses of hexamethylenamin have been suggested, but the results have been disappointing. Intraspinal injections of colloid silver have also been tried without marked success. Antipneumococcus serum has also been tried in a few cases, injecting the serum directly into the meninges by means of a lumbar puncture, but, in the few cases in which this has been tried, the results have been negative.

**MENINGITIS DUE TO THE PARAMENINGOCOCCUS.** Since Dopter called attention to the parameningococcus, there have been a number of contributions upon this subject. It will be remembered that this organism resembles the meningococcus in every way except that it is not agglutinated by the antimeningococcic serum. The clinical picture produced by this organism does not differ from that produced by the meningococcus. Dujarric de la Mevière and Dumas<sup>1</sup> have made a report upon this subject, and they suggest that it is quite probable that some of the negative results obtained by the use of the antimeningococcus serum are due to the fact that the exciting cause of the disease is a parameningococcus. There have been quite a large number of cases reported, chiefly in France; in some there is a true parameningococcus septicemia and the meningitis is only one phase of the infection. Three different forms of infection may be found; pure septicemia,

<sup>1</sup> Gazette des Hôpitaux, August 9, 1913, No. 19, p. 1439.

septicemia with signs of meningitis, and, lastly, meningitis without general involvement. The important question in the differential diagnosis is purely a laboratory matter. If the cerebrospinal fluid contains organisms which resemble the meningococcus in shape, it is, under ordinary circumstances, reasonably safe to assume that it is the organism described by Weichselbaum. To differentiate this and the parameningococcus requires a considerable amount of study. They are apt to be less frequent in slides made from the cerebrospinal fluid than the meningococcus, and in cultures it is somewhat larger. Both are decolorized by the Gram method of staining, but are easily stained with the ordinary aniline dyes. It might also be noted that the organisms in the cultures of the parameningococcus are more regular in size than in the cultures of the meningococcus. In common with the meningococcus, the parameningococcus ferments glucose and maltose, but not levulose. The micrococcus catarrhalis, which resembles both of these organisms, does not ferment any of these sugars, and the gonococcus only glucose. The chief difference is in the agglutination test, the meningococcus being agglutinated by the antimeningococcic serum which has not been heated, while the parameningococcus is not agglutinated. The precipitin test is of value, and the complement deviation test may also be used. Further tests may be made by animal experimentation which are fully outlined in the article referred to. Toward the end of 1910, Dopter commenced to immunize a horse with the parameningococcus, and was able to produce an antiparameningococcus serum. In 1912, he reported 12 observations in which there was infection by the parameningococcus and without the serum the mortality was 100 per cent. He also reported 1 case of septicemia and 1 case of meningitis in which the serum was used and both patients recovered. Since that time, there have been 7 cases treated with this serum, 2 of which died, and 5 were cured, 3 of which were without any further disturbance, 1 had very slight traces left, while 1 remained deaf and had disturbance of locomotion. The same general method in vogue for the use of meningococcus serum applies to this serum. A rather complete bibliography is appended to the article.

GLYCOSURIA IN TUBERCULOUS MENINGITIS. This is a subject that has attracted very little attention, first having been observed by Loeb in 1884, and subsequently a number of observers, chiefly English, have noted its occurrence. It is usually developed just before death, and Frew and Garrod made a study of 41 cases in which glycosuria was found in 15, or 36.6 per cent. In 2 cases, sugar was first found in the urine twenty-four hours before death; in 10 cases, forty-eight hours before death; in 1 case, seventy-two hours; and in 1 case, ninety-six hours. One patient developed glycosuria nine days before death, and this, unfortunately, was the only case of the glycosuria series on which no autopsy was permitted. The cases showing glycosuria showed no

difference from those in which no sugar appeared in the urine, nor was there any obvious influence of sex nor age in this respect.

This variety of glycosuria probably has its origin in the cerebral lesion and belongs to the nervous group, but at this time the special lesion which produces it has not been determined. Loeb suggested that the examination of sugar in these cases might be due to the involvement of the pituitary gland which undoubtedly has a marked influence upon carbohydrate metabolism. In not a few of the cases there was a marked exudation in the neighborhood of the pituitary gland, but there were other cases in which no sugar appeared in which there was also exudate in that location, and still others in which there was little exudate in which the glycosuria was present. The microscopic examination of the pituitary bodies of the patients studied did not show any demonstrable lesion.

**Mumps.** PANCREATITIS IN MUMPS. In previous years I have made short notes concerning the appearance of pancreatitis in mumps. There has been a certain amount of question concerning these cases, but there does not seem to be any doubt that toxins of various infectious diseases may cause alterations in the parenchyma and in the interstitial part of the pancreas analogous to those which are found in other organisms. In 1897, Cuche collected 20 cases, all of which were not perfectly clear, and his communication was followed by Priestly with 2 cases, and Jacobs with 1 case. Other observers have reported isolated instances. In 1903, Simonin contributed an interesting article with 10 cases, and in 1904 Galli reported 4 instances of this affection.

Allegrì,<sup>1</sup> during an epidemic of mumps that occurred from November, 1911, until April, 1912, had 4 cases come under his care in which there were marked symptoms of changes in the pancreas. One case was in a boy, aged nine years, who had fever, and, as two of his sisters had recently had mumps, the same diagnosis was made in his case. The day following the beginning of the disease there was swelling of the right parotid, and the patient had extremely severe pain in the epigastrium, hiccough, vomiting, and diarrhea, and a slightly distended abdomen. The pain was increased on pressure. The following day the left parotid became involved, and after two or three days, in which all the symptoms persisted, the patient began to convalesce rapidly. Examination of the urine did not show either sugar or albumin. A second instance occurred in a man, aged twenty-one years, with swelling of both parotids and marked fever, on the fifth day of the disease, had an increase in the temperature and vomiting, which was preceded by marked nausea. There was severe, epigastric localized pain, which was increased on pressure, with serous diarrhea; these symptoms persisted for several days, and then got progressively better. There was

<sup>1</sup> Il Policlinico sezione pratica, October 19, 1913, p. 1518.



neither sugar nor albumin in this case, but the presence of biliary pigment was very distinct. The other cases were very similar to the ones just related. In a general way, the symptoms which accompany the acute pancreatitis of infections have been grouped by Deguy, as follows: (1) Glandular symptoms, glycosuria, polyuria, polyphagia, stearrhea, and rapid emaciation; (2) infective symptoms, fever, albuminuria, loss of strength, and cold sweats; (3) local symptoms, epigastric pain, nausea, vomiting, hiccough, diarrhea, tympanites, and icterus. Allegri discusses, at some length, the relation of these symptoms to his cases, but there can scarcely be any question that such a train of symptoms, even though not accompanied with changes in the urine, are to be regarded as mild forms of pancreatitis.

INVOLVEMENT OF THE OVARY IN MUMPS. The involvement of the ovary in mumps is mentioned by many authors, but very few cases are actually observed. Most of our knowledge on this subject is from the very early writers, with a few exceptions, among which may be mentioned a study by Troitsky,<sup>1</sup> who, in an epidemic occurring in a group of young girls, found involvement of the ovary in 13 instances. It seems quite probable that there may have been some mistakes in diagnosis in this report. Brooks<sup>2</sup> has reported 2 cases in women, 1 aged twenty-eight years, and 1 aged twenty-four years, in which the involvement of the ovaries is very plainly made out. Almost all of the cases that have been reported have been found in young girls or in very early age. In the first case reported by Brooks, the ovary became involved on the seventh day, and it was first thought that the patient was suffering with a salpingitis or an ovarian tumor. The severe pains subsided two days later, and some ten days after this the ovary was found to be much reduced in size, although still painful. This patient did not become pregnant during the five subsequent years during which she was under observation, and she was eventually lost sight of. In the second case, the ovary was involved five days after the beginning of the disease, and the affection was characterized by very marked pelvic pain on both sides. Both ovaries were found to be enlarged to the size of a hen's egg and very tender. Two days later both mammary glands became greatly swollen and the nipples inflamed, but she subsequently made a perfect recovery. In this case, too, there has been no subsequent pregnancy. One cannot draw conclusions regarding the effect of mumps upon the possibility of child-bearing from 2 cases and it will be exceedingly interesting to have a larger series of cases with reference made to this point which, up to the time of Brooks, has not been mentioned.

THE ETIOLOGY OF MUMPS. It has recently been observed by Petrilli<sup>3</sup> that epidemics of mumps are always preceded by an epidemic of pharyn-

<sup>1</sup> Vratich, 1903, 1, No. 15.

<sup>2</sup> Journal of the American Medical Association, February 1, 1913, p. 359.

<sup>3</sup> La Semaine Médicale, 1913, p. 453.

gitis. Bonazzi<sup>1</sup> has independently made a somewhat similar observation in an epidemic of mumps that occurred in the institute for Children in Bologna. There were about 400 students, and 90 per cent. of these were attacked. In nearly every one of the patients examined, small ulcerations were present upon the face, some of which were quite deep. In the following year, 1913, he had an opportunity to observe another epidemic of mumps under different circumstances. In 39 cases, he found that 18 had sometimes as many as 15 different small ulcerations upon the lip, nose, or ear, previous to the attack; 11 other patients had had sore throat, and, in 7 others, at the time they had the mumps, there was a marked hyperemia of the mucous membranes of the palate and tonsils. This opens up the question of the transmissibility of mumps. It has long been known that epidemics are usually circumscribed and usually limited to those who are in actual contact with those suffering with the disease. It is possible that, in some cases, the infection may take place through openings in the skin, and this will lend a new interest to future epidemics of mumps to which but little attention has been paid.

A NEW MICROCOCCUS AS THE CAUSE OF MUMPS. Merelli,<sup>2</sup> of the Medical School of Pisa, has reported his findings in 8 cases of mumps, in all of which he was able to isolate an organism which he calls the *Micrococcus tragenus*, and which he believes to be the cause of mumps. He found it in the blood and from the serous fluid of the testicle in the cases which were complicated with orchitis. This organism differs somewhat from those which have been described by other observers in that it does not stain by the Gram method, and does not liquefy gelatin. It does not coagulate milk, and on agar forms small round colonies with a whitish appearance and somewhat irregular edges. Inoculation experiments on small animals in the laboratory were negative. The organism gave the agglutination test in dilutions as low as 1 to 500, while they were negative for serum in healthy individuals. This work, while very interesting, will have to be confirmed by other observers before it can be accepted, and, in a disease like mumps, upon which quite a large number of researches have been made, any organism which can be isolated with the ordinary technique will naturally be questioned.

**Mycetoma in America.** Madura-foot disease was first described by Keampfer, in 1712, but the disease was not recognized in America until 1895, when Adami and Fitzpatrick described a case in a French Canadian who had never been outside of Canada. Up until this year 5 cases in all have been reported, one of which had lived in India, one was a native of Iowa, and two were Mexicans. Wright's case was in

<sup>1</sup> Bullettino delle scienze mediche di Bologna, August, 1913.

<sup>2</sup> Il Policlinico, Sezione Practica, January 12, 1913, p. 62.

an Italian woman. Sutton<sup>1</sup> had 2 cases under observation. Both of these patients were in the habit of living outdoor lives in a subtropical country, and the usual history of the disease as found in the East is that 91 per cent. are in farmers or persons living in the country and the remaining 9 per cent. are individuals who spend most of the time in the open air and barefoot.

Three variations of the disease are described, one in which the granules are yellow or ochroid, and the others where it is black or red. The yellow variety is commonest, the red is exceedingly rare, and with the exception of one case occurring in Italy, neither the black nor the red forms have been described outside of India. It has often been stated that the yellow, or common, variety of Madura-foot disease is the same as actinomycosis. This is probably not the case as Musgrave and Clegg, two years ago, made studies upon the etiology of mycetoma and found that, in 40 inoculation experiments performed on monkeys, guinea-pigs, rabbits, dogs, and pigeons, in three instances typical examples of the disease developed in the monkeys after the injection of cultures of the organism into the tissues of the foot. In no instance was a progressive disease produced by inoculation into other parts of the body.

In the first of Sutton's cases, the patient was a laborer, aged twenty-four years, who, after refusing operation, was treated by the use of potassium iodide and copper sulphate internally, with the x-ray and various preparations of iodine externally. There was very little change in the lesion after two months' treatment. The second patient, after considerable local treatment without benefit, consented to amputation. It is quite probable that the disease is more common than is ordinarily believed in this country. The diagnosis consists in recognizing the inflammatory process on the foot, associated with small sinuses from which escape small, yellow or other colored granules very suggestive of actinomycosis. This whole group of organisms needs further study, both in regard to the biological classification, and also as regards the disease-producing properties, particularly the determination of a more simple and certain method for differentiating the various members of the group.

**Oriental Sore of the Nasal Mucosa.** It is quite probable that there are cases of oriental sore which are unrecognized because the average physician is unfamiliar with the clinical appearances. Bates<sup>2</sup> has reported an interesting case in which the lesion was situated on the nasal mucous membranes, with some deep ulcerations on both ears, and, to a less extent, on the extensor surfaces of both elbows. The lower half of the nose was swollen to about twice the normal size, indurated, and extended to both cheeks. There was considerable ulceration and the case was at first thought to be one of leprosy, but smears from the septum showed

<sup>1</sup> Journal of the American Medical Association, May 3, 1913, p. 1339.

<sup>2</sup> Ibid., March 22, 1913.



many pus cells and a moderate number of *Leishmaniae*. Involvement of the nasal mucous membrane by the *Leishmania* is of extremely rare occurrence, and the diagnosis in a case of this kind depends entirely upon the findings in the pathological laboratory.

**Paratyphoid Fever.** I have, from time to time, noted the appearance of this fever in the United States and there have been comparatively few verified epidemics of it, although it seems quite probable that many of the epidemics which are reported as typhoid may be of this nature.

An epidemic of considerable interest occurred in a surgical hospital at Roanoke, Va., and is reported by Lumsden, Freeman, and Foster.<sup>1</sup> There were 32 people on the staff, and 38 patients, making a total hospital population of 70. Among these there were 16 cases which were verified bacteriologically, and 2 other cases which were probably paratyphoid but which were not verified. The epidemic is of particular interest on account of its beginning in the winter. The first suspected case was a colored boy who was a helper in the kitchen, who, on January 9, developed a high fever. A blood culture was made, but it proved negative, and the boy left for his home in the country. Ten days later the resident surgeon developed fever, and was confined to his bed for seven days with what was supposed to be influenza. Widal test was negative from typhoid, but there was suggestive clumping with the paratyphoid B. No other cases developed until February 14, when, in the next six weeks, 16 cases developed.

There were a few, or no, prodromal symptoms, the fever developed suddenly and reached its maximum of  $104^{\circ}$  or  $104.5^{\circ}$  in two or three days, then gradually returned to normal in from five days to three weeks. The symptoms were all very mild and the patients were apparently comfortable throughout. One case had dysenteric symptoms, but in the other 15 cases there were no symptoms of note, and hemorrhages were absent. Rose spots were present in most of the cases. The diagnosis was made by the agglutination reactions, and by isolating the organisms from the blood and the excreta of the patients. The incubation period varied from five to ten days, with an average of 8, and, in one case, the patient spent only a few hours in the hospital and eight days later developed the disease.

The spread of the disease could not be blamed on any one individual, although one visitor to the hospital did see 10 of the cases at one time or another. After careful study, it was thought the epidemic was caused by the conveyance of the infection by persons who were attending actual, but unrecognized, cases of paratyphoid fever, and the infection having been produced may have been transmitted by drinking glasses, thermometers, and the like. The epidemic was very easily controlled by the rigid isolation of all the cases, the disinfection of the

<sup>1</sup> Public Health Reports, May 30, 1913, p. 1041.

excreta, bed pans, and urinals. There was, in addition, a strict medical asepsis on the part of all nurses upon going from patient to patient; in addition to these measures, there was a thorough, general cleaning of the hospital and fumigation of the pantries and kitchen, to destroy insects, and general measures were adopted for ridding the hospital of flies. This epidemic is exceedingly instructive in showing how rigid isolation, coupled with sensible disinfection and a strict medical asepsis, will control an epidemic of this nature, especially in the absence of flies. The food, including the milk and the water supplied to the hospital, was not believed to be the cause of the disease in this instance, but they should not be forgotten in considering measures for preventing the spread of paratyphoid fever.

**Pellagra.** THE EPIDEMIOLOGY OF PELLAGRA. The subject of pellagra continues to occupy a great deal of attention; it is a disease which is being studied in a great many different ways, and among the numerous articles there is one by Seiler and Garrison.<sup>1</sup> They made a very careful study of the disease as it exists in Spartanburg County, S. C. and they hope, eventually, to clear up the question as to whether the disease is of an infectious nature or not. The disease is found in various parts of the county, but distributed with great inequality throughout the country districts. It was found at the rate of 34 per 10,000 of the population, while in Spartanburg, with a population of 17,517, the rate was 49 per 10,000. In other words the disease has a tendency to vary with the density of the population, but there are many inequalities of its distribution which cannot be explained in this way. In the cotton mill villages, the rate of prevalence was 104 per 10,000, as contrasted with 19 per 1000 for the remainder of the county. It would seem, at least in Spartanburg County, that the variations in rate of prevalence in the ten townships is in a measure proportionable to the presence or absence of a large mill village population, but outside of these mill villages there is still unexplained variations in its distribution. The negro, while not exempt, does not suffer as greatly as the white race, and, in both whites and negroes, females are affected very much more often than males. Under ten years of age, and over forty-five, the sexes are affected about equally. Another very curious point, which Seiler and Garrison brought out, is that the rate of prevalence drops among males between the ages of nineteen and forty-five, while in females there is a remarkable number of cases occurring between these ages. The disease was found to be particularly prevalent in women who are employed in housework, and, while the disease is found more frequently in the mill villages than elsewhere, it is more common among women and children who are home during the day than it was among the actual workers, in whom the rate of prevalence in the two sexes

<sup>1</sup> American Journal of the Medical Sciences, July, 1913, p. 66, and August, 1913, p. 238.

is about equal. The question concerning the importance of family relationship and household association are to be the object of further study, but, in the cases observed, in one-half there was one case in one family, in about one-fourth of the cases two in one family, and the remaining fourth occurred in groups of three, four, and five in one family. When there was only one case in a family, it was usually in one of the women. When there was more than one case, the second case was apt to be in a child. In Spartanburg county, the disease could be traced back as early as 1894, but there does not seem to have been any great number of cases until 1908. Since that time the cases have rapidly increased up to 1911. They did not find any evidence pointing to spring and fall recrudescence of the disease which has been observed in other localities, but they did find that climatic conditions appear to influence some of the symptoms of the disease. In the spring months, with a low temperature and an excessive number of rainy days, the acute symptoms, more particularly those involving the skin, were delayed in their appearance. Prior to 1912, a large proportion of the cases showed intestinal and nervous symptoms of great severity. In 1912, many of the symptoms were quite mild and almost exclusively confined to the skin. They found that the majority of cases, 83 per cent., were living under unfavorable conditions, and that the disease is more prevalent in poor people than in the well-to-do. The condition of the house and premises in which most of the cases occurred was extremely unsanitary. Throughout the county there is an absence of properly constructed privies, and an almost complete absence of screening of dwellings, the lack of which present a highly favorable condition to the transmission of the disease if the virus is eliminated in the excreta, as it permits of direct contamination of food and person and by insects. Seiler and Garrison could not discover any relation between the more common foodstuffs and the disease, those with pellagra and without subsisting upon approximately the same diet. The only striking thing noted was the limited use of fresh meat, and the unhygienic preparation of food in general. They were not able to find any relation pointing to the agency of corn as an etiological factor of the disease.

INSECTS AS A POSSIBLE ETIOLOGICAL FACTOR IN PELLAGRA. Jennings and King<sup>1</sup> have made an exhaustive study of this question, the work also being done in Spartanburg County, South Carolina, and they lay considerable stress upon the disease being one which is essentially rural in its nature, although it may occur in cities of considerable size. They believe, however, where such cases occur in cities, that the rural elements governing the presence and abundance of insects is predominant. They believe that the occurrence of isolated sporadic cases is highly suggestive of an insect carrier, and that this is also borne out

<sup>1</sup> American Journal of the Medical Sciences, September, 1913, p. 411.



by the fact that there is little existing evidence that the disease is transmitted by direct contagion and also by the fact that the disease has a low degree of infectiousness.

The insects studied were especially those of blood-sucking habits, special attention being given to two-winged flies, lice, bed-bugs, fleas, and ticks, while roaches came in for a certain amount of attention. Horse-flies and cockroaches were soon ruled out of the possibility of transmitting the disease for many reasons, and ticks and fleas were excluded on account of their scarcity and the nature of their biting habits. Lice and bed-bugs did not account for the sex or age incidents, or the rural nature of the disease, and the scarcity of lice seemed to be an additional reason for excluding them as a possible etiological factor. As regards mosquitoes, they are comparatively rare and their distribution did not coincide with that of pellagra for the state in general; in addition to this, the species ordinarily found had night-biting habits which would fail to account for sex incidence.

Three insects deserve particular attention; the house-fly, the buffalo gnat (*similium*), and the stable fly (*Stomoxys calcitrans*). The house-fly (*Musca domestica*) was found in all the houses in which there were cases of pellagra, as well as in all others, and Jennings and King believe that, as long as the transmissibility of pellagra is unproved, and the nature of its virus and the manner of its communication are unknown, the house-fly must be regarded with suspicion. In regard to the *similium*, the investigators just mentioned do not believe, so far as America is concerned, that this insect would be considered as the cause of pellagra had it not been for the publication by Sambon. In Spartanburg County, they found that they were hardly known as a pest to man, and, when they did bite, it was only in certain localities and very largely confined to field workers. They also state that, according to information received from Bellan, the Imperial Entomologist of the Barbadoes, while pellagra occurs endemically on the islands, there are no species of *similium* found there. They found that the stable-fly had a number of characteristics which would fit in very well with its being a factor in the cause of the disease. They found it widespread, the season of the stable-fly and the pellagra coincide, although the period of its greatest abundance is somewhat later than the maximum intensity of pellagra. It is particularly abundant in the rural districts, and bites by day only, which offers an explanation of the sex incidence and also of the age distribution. It also is capable of making long flights, which would account for the sporadic cases of the disease.

PELLAGRA IN ENGLAND. The question of the etiology of pellagra is still so uncertain that one hesitates to class it as an infectious disease, yet the appearance of the disease in England, where it evidently has existed for some time unnoted, would seem to point more to its infectious character than to its production by food, as the character of food ordinarily supposed to cause it is not commonly used in England.

Blandy<sup>1</sup> has reported 11 cases in which the diagnosis was confirmed by Dr. Sambon. At least one case came from near a river in which the similium were known to be present, and it is comparatively easy to associate the life history of any individual patient in England with someone or other river. Most of the cases began in the summer time, as far as could be ascertained.

**EXPERIMENTAL PELLAGRA.** Attempts to produce pellagra in animals, especially by means of various foodstuffs, has, as a general thing, resulted in failure. Harris,<sup>2</sup> in order to prove that the causative agent was contained in the various tissues of the person having the disease and that the virus could be transferred to susceptible animals and reproduce the malady, several years ago started some animal experiments which he has just reported. Portions of the skin, alimentary tract, and particularly the brain and spinal cord from a cadaver recently dead of pellagra, were mixed with equal amounts of normal saline solution, ground together in a mortar, and allowed to stand in an ice chest overnight. This material was filtered through a coarse filter, and then the juice passed through a letter N Berkefeld filter. A full-grown monkey, *Macacus rhesus*, was used as the subject of the experiment, and large quantities of the filtrate were injected subcutaneously, intravenously, and intracranially. The animal remained apparently normal for many months, although it eventually developed all the signs of pellagra, and finally died. In 1912, another typical, fatal human case was available, and this experiment was repeated. The second animal remained normal for a period of two months at which time the disease became manifest, and, at a subsequent date, the disease was again reproduced in the same manner in a third animal. These experiments seem to show that pellagra may be transmitted to the monkey by means of a Berkefeld filtrate from the tissues of the human subject, and it seems highly probable that the cause of pellagra is either a filterable virus or some microorganism sufficiently small to pass through the pores of a letter N Berkefeld filter.

**Bubonic Plague.** **THE VACCINE TREATMENT IN BUBONIC PLAGUE.** Row has made a short communication upon this subject, giving his experiences during the past year. The vaccine was first prepared from subcultures of plague bacilli grown on agar, and these cultures were sterilized by the use of glycerin and not by heat. The doses of vaccine correspond, as a rule, to  $\frac{1}{1000}$  of an agar tube, or to about 75,000,000 or 80,000,000 bacilli. Even double this dose is well borne. Only one injection was given at the earliest opportunity. Eighty-seven cases were treated. Forty-four non-septicemic cases showed 35 recoveries, or 79.5 per cent. In 43 septicemic cases, every patient died. In every case, blood cultures were made to determine whether the plague bacilli

<sup>1</sup> *Lancet*, September 6, 1913, p. 713.

<sup>2</sup> *Journal of the American Medical Association*, June 21, 1913, p. 1948.

were circulating in the peripheral blood. The blood was obtained by a needle prick of the finger tip and taken out of a straight glass pipett and planted on the dry surface of an agar tube. The finger was sterilized with ether, alcohol and a spirit lamp were used to sterilize the needle and pipette, and not a single contamination was found in all the cases observed.

THE OUTBREAK AND SUPPRESSION OF PLAGUE IN PORTO RICO. The outbreak of plague which started in San Juan, in June, 1912, and which finally resulted in some 55 cases, of human plague, with a mortality of 65 per cent., has been reported by Creel.<sup>1</sup> The report of this epidemic and the methods used to stamp it out are of particular interest owing to the proximity of this epidemic to the United States.

The number of fleas in Porto Rico is low compared with other tropical countries; five different varieties were noted on the rats, including dog fleas and chicken fleas. It is quite probable that the rats were affected several weeks before the disease occurred in human beings, as there is a marked and unexplainable mortality among the rats along the water front a month or more before the plague was noted in man. Following the fight against the rats by means of rat-proofing, trapping, and poisoning, there elapsed a period of eighty-four days before the rats caught were free from plague fleas.

It is important to note that the suggestion of burning the part of the town infected would not have been as effective in stamping out the disease as rat proofing and would have involved an enormous loss of money. The rats for the most part would have been driven into other quarters, and so the epidemic would have spread farther instead of being restricted. It is also important to note that the general unsanitary conditions were in no way productive of plague. As a matter of fact, the better part of the town was more affected than some of the congested, shanty districts. At the time of the report, there were 1127 buildings in the town, and these were all either elevated two feet above the ground or had concrete floors and side walls. In addition to carrying on the rat proofing in the quickest possible manner, careful supervision was carried out on all inland freight, so that no rodents should escape from the town in this manner. A large force of men were put to work trapping and poisoning the rats, and all animals so collected were tagged with their location and subsequently examined by a special laboratory force. In addition, sulphur fumigation of all the infected premises was carried out. No disinfection was utilized in the absence of the pneumonic type of the disease, the whole work being directed to flea destruction and the destruction of the rats. In addition to the sulphur fumigation, petroleum sprays were largely used. The whole work of eradicating plague in this place is a very good example of what

<sup>1</sup> Public Health Reports, May 30, 1913, vol. xxviii, No. 22; June 26, 1913, No. 23.



careful scientific work can accomplish as contrasted with the former hysterical destruction of property often practised and even now so frequently advised.

**Pneumonia.** ACUTE PNEUMONIA OCCURRING DURING THE ARSENIC TREATMENT. Among the many curious factors which seem to influence the occurrence and the course of pneumonia is the continuous administration of arsenic. Five cases illustrating this have been reported by Weber.<sup>1</sup> All his cases occurred in children under fifteen years of age, the youngest being four. The patients were all taking arsenic either for lymphadenoma, chorea, or for skin affections. In all these cases, the patients recovered from the pneumonia even though the general condition was extremely bad apart from the lung complication, and there was very little in the way of distressing cough or pain. Weber is of the opinion that the prolonged administration of arsenic predisposes children to pneumonia, but probably also exerts a favorable influence on the reaction of the body toward the disease. Two of his cases also had herpes zoster which has been supposed by some to be due, in part at least, to the continuous administration of arsenic.

PNEUMONIC LESIONS MADE BY INTRABRONCHIAL INSUFFLATION OF NON-VIRULENT PNEUMOCOCCI. Pneumonia is a disease which has been studied from many different points without affecting either the diagnosis, prognosis, or treatment, and yet everyone believes that the work which has been done will eventually lead to some very tangible and practicable results. Lamar and Meltzer have produced pneumonia in a large number of animals by insufflation of cultures of a highly virulent pneumococcus, and a smaller number by the insufflation of *Streptococcus mucosus* and of Friedländer's pneumobacillus. Wollstein and Meltzer<sup>2</sup> have produced lobular pneumonia in dogs by the insufflation of cultures of streptococcus and of the influenza bacillus. These experimental results agree with the pathological experience with human beings. As in lobar pneumonia, the pneumococcus is found in the exudate, and in bronchopneumonia the streptococcus is more often present. The latter investigators have carried on a series of experiments with intrabronchial insufflation of a non-virulent pneumococcus. They found that this causes the development of an exudate in the lungs, which, in general, leaves the framework infected, while the lesion presents the gross appearances of lobar pneumonia. There are several striking differences from the pneumonia produced by virulent pneumococci, in that the consolidation tends to a more rapid resolution, the disease is non-fatal and the blood is not invaded by the organism, and the exudate is strikingly poor in fibrin. These experiments show pretty conclusively that the different types of pneumonia are produced by a specifically different bacteria, and that the differences in the nature

<sup>1</sup> British Medical Journal, February 15, 1913.

<sup>2</sup> Journal of Experimental Medicine, March 1, 1913, p. 353.

of the lesion are due rather to degrees of virulence of the causative organisms than to differences in the species.

Another piece of experimental work along the same line is that of Hirshfelder and Winternitz.<sup>1</sup> These observers experimented with benzene (benzol) and toluene (toluol). The former of these has a very powerful leukotoxic action, and not only destroys the leukocytes in the circulating blood, but affects the blood marrow and other blood-making organs. The effect of toluene, however, is such as to produce no apparent effect upon the white-blood cells.

It was found that animals who were treated with benzene rapidly died from induced pneumonia, whereas those treated with toluene showed no decrease in their resistance. It is a very clear demonstration of the role of the leukocyte in the resistance of animals to experimental pneumonia. If substances which are injected will increase the number of leukocytes before the experimental pneumonia is produced, the animals will apparently acquire an increased resistance. Kline and Winternitz<sup>2</sup> have established the fact that the number of organisms injected, in the production of experimental pneumonia, has considerable influence as to whether the animals recover or not. If a small number were used, the animals recovered; when rapid doses were given, the animals developed an active immunity so that they were able to withstand increasing doses of pneumococci, even when given by insufflation into the trachea. They found that the serum of these animals could be used successfully in conferring passive immunity in other animals of the same kind.

Peabody and Butterfield<sup>3</sup> have found that the pneumococci are apparently responsible for the diminution in the capacity of the blood for carrying oxygen, and this is apparently due to the formation of methemoglobin. This was worked out first in laboratory experiments outside of the body, and, subsequently, it was demonstrated that similar changes take place in the body of animals when there is a severe pneumococcus bacteriemia. More recently, Peabody has been able to demonstrate the same thing in severe pneumonia occurring in human beings. He found that, in the majority of patients suffering from uncomplicated lobar pneumonia, the decrease of respiratory service was completely compensated for, and that the oxygen content of the blood remained at its normal limits. In the last stages of the fatal cases when death does not occur suddenly, it was found that there is a progressive diminution in the oxygen-content of the blood, and, along with this, a decrease in the capacity of the blood to combine with oxygen. In many cases of pneumonia, it seems quite probable that these changes in the blood are responsible for many of the symptoms, particularly the terminal ones. These studies will aid considerably

<sup>1</sup> Journal of Experimental Medicine, 1913, vol. xvii, p. 666.

<sup>2</sup> Ibid., vol. xiii, xvii, p. 50.

<sup>3</sup> Ibid., 1913, xvii, p. 598.

in clearing up the many problems in connection with pneumonia, and it is to be hoped that eventually some satisfactory serum, or other remedial agent, will be found.

**THE TREATMENT OF PNEUMONIA WITH ETHYLHYDROCUPREIN.** Various drugs have been suggested as specifics in pneumonia, but none of them have stood the test of any very long experimentation, although some of them do seem to give results which would warrant further experimentation along this line. Following Ehrlich's discoveries in chemical therapy, a number of different suggestions have been made, but perhaps the most notable is that of the use of quinine which has been tried both in this country and abroad. The large doses of quinine required are sometimes followed by amaurosis, or other of the well-known features of quinine poisoning, so that other drugs have been considered that might replace it. Among these is ethylhydrocuprein.

Lenné<sup>1</sup> has made a report upon the use of this drug in pneumonia. Wright found that when this drug was given by mouth, it could be found later in the blood serum of the patient, and that it had a specific antiseptic action, but, as far as his experience with the drug in pneumonia was concerned, he believed that it was without any effect or only a questionable one. Lenné used the drug in a number of cases, giving it by mouth; in 17 cases in which the drug was used, there were 2 deaths, or a mortality of 11.8 per cent. In 18 cases he used the drug in connection with the pneumococcus serum, with 3 deaths, or a mortality of 16.5 per cent. In 6 cases in which the pneumococcus serum was used alone, there were 2 deaths, or a mortality of 33 per cent.; in 40 cases in which no particular specific treatment was tried, there was a mortality of 12, or 30 per cent. He believes that, inasmuch as the cases in which the ethylhydrocuprein was used showed such a marked lowering in the mortality, further experimentation along this line is justified. He was not able to make out any particular change in the local processes, and he believes that the drug acts through killing the pneumococcus and so lessening the amount of intoxication and consequent lesions.

**Poliomyelitis.** **THE CULTIVATION OF THE MICROÖRGANISM CAUSING POLIOMYELITIS.** Numerous studies have been made on this subject. As early as 1905, Giersvold demonstrated a micrococcus in the cerebrospinal fluid, and, in 1911, Fox cultivated a bacillus from the circulating blood. Neither of these organisms have stood the test of further investigation. Proescher<sup>2</sup> was able to demonstrate some coccus-like bodies in stained preparations made from the central nervous system of monkeys suffering with experimental poliomyelitis. They are very similar to the bodies that have been demonstrated in the nervous system of animals infected with rabies.

<sup>1</sup> Berliner klinische Wochenschrift, October, 1913, p. 1984.

<sup>2</sup> New York Medical Journal, 1913, vol. xciv, p. 741.



Noguchi,<sup>1</sup> working with Flexner in the Rockefeller Institute, has succeeded in growing microorganisms by the use of Noguchi's method for cultivating spirochetæ, the material used being nerve tissue derived both from human poliomyelitis, and also from experimental poliomyelitis in monkeys. The first thing is to obtain the nervous tissue in as early an aseptic condition as possible and for this purpose the brain is to be preferred, because it is more easily separated from the rest of the body in a more suitable condition than the other portions of the nervous condition. Pieces of about 2 c.c. thickness are taken, and inoculations are made both with fragments and, if there is any reason to suspect contamination, with filtrates. The filtrates are made by grinding the nervous tissue with sand in distilled water or normal salt solution. This emulsion is then shaken in a machine for about thirty minutes, centrifugalized, and the supernatant fluid filtered through an N or V Berkefeld filter. The culture medium used is made of human ascitic fluid to which has been added a fragment of sterile, fresh tissue.

For the initial cultures, it is necessary to exclude oxygen by covering the liquid with a deep layer of sterile paraffin oil. It is not essential that the tubes be placed in an anaërobic jar, but it would seem that the initial growth is more easily obtained when this is done. The tubes for the cultures measure 1.5 by 20 c.c., and in each of these is placed a fragment of sterile rabbit kidney and a fragment of an equal size of nervous tissue. Upon these are poured about 15 c.c. of sterile ascitic fluid, and, finally, about 4 c.c. of sterile paraffin oil. The ascitic fluid must be originally sterile, as sterilization either by fractional heating or filtration renders it unsuitable. The experiment is controlled by other tubes containing kidney and ascitic fluid, and brain and ascitic fluid; two sets should be prepared, one of which is to be placed in an anaërobic jar and the other kept outside, but both to be cultivated at the ordinary thermostat temperature, namely, 37° C. The tubes in the jars are not disturbed for from seven to twelve days. Those outside may be inspected daily. If within one or two days there is turbidity, coagulation or gas-production, the tubes may be discarded as being grossly contaminated. Small quantities of the medium are removed with pipettes and stained for bacteria in the ordinary way, and cultivated upon the usual solid or fluid media. If the clear tubes show organisms, they may also be discarded. In the other tubes, at the expiration of about five days, there is opalescence about the organisms at the bottom of the tube. This may be gradually diffused throughout the tube by gentle shaking. The control tubes, when not contaminated, either remain perfectly clear, or have a slight granular precipitate of washed-out granules of tissue about them. In from three to five days, the opalescence extends into the upper portions of the medium,

<sup>1</sup> Journal of the American Medical Association, vol. lx, p. 362; Journal of Experimental Medicine, October 1, 1913, p. 462.

while, in the control tubes, the precipitate gathers more and more at the lower end of the tubes. After ten to twelve days, the diffuse opalescence diminishes, and small particles of it begin to fall slowly to the bottom of the tube. The tubes in the anaërobic jar, on the seventh day, show a similar growth, but somewhat less marked. At the end of five or six days, the appearance is very much that of the tubes that have been kept in the air for one week. The organism may also be cultivated on a solid medium consisting of ascitic fluid and sterile rabbit tissue to which a suitable culture of 2 per cent. nutrient agar has been added in order to produce a solid mixture. This is not suitable for the initial growth, but, once the culture has been secured in the fluid medium, it is possible sometimes, but not always, to transmit it to the solid medium. It is possible to secure cultivation even in the absence of the rabbit tissue, and for this purpose a somewhat larger fragment of nerve tissue is used. The experiment is less apt to succeed, however, than when the rabbit tissue is used.

Other fluid culture media have also been used, consisting of sheep serum water, or an extract prepared from the brain tissue, but neither of these are suitable without the addition of rabbit tissue, and they are not as useful in studying the organism. Glycerinated fragments of nervous tissue kept in 50 per cent. glycerin, at a temperature of from 2° to 4° C. for periods varying from twenty-five days to one year, were also used and the resulting growths, when they occurred, produced the characteristic appearances already noted. In 33 experiments, an initial growth was obtained in 19 instances, 16 of which proved to be pure, and 3 were mixed with other organisms. Of these, pure subcultures were obtained thirteen times, and in many of these the subcultures were maintained alive for an indefinite period. The fluid cultures, under the dark field microscope, show globular bodies of very small size which hang together in small chains, parts, or in small masses. They are devoid of the independent motility and difficult to separate from the numerous small moving granules which are always present. The stain preparations bring these small bodies out plainly. The organisms may be stained either by the method of Giemsa, or by Gram's method, but in either case the staining is accomplished with more or less difficulty.

From the fact that the microörganism described was so constantly found in the central nervous system of both human beings and monkeys infected with poliomyelitis, it was strongly presumptive that it bore a very close relation to the disease. Two series of inoculations were made into *Macacus rhesus* monkeys, one being from cultures derived from human beings, the other from monkeys. The cultures were inoculated into the brain, or into the sciatic nerve or peritoneal cavity simultaneously. It was possible to produce, in monkeys, typical poliomyelitis which showed typical lesions at autopsies, and from which,

in some instances, the culture could again be recovered. The micro-organism can be detected in film preparations and in sections prepared from the central nervous system of human beings who had died of poliomyelitis, and from monkeys in which the disease has been produced experimentally. It will not be necessary to go into the technique which was devised by Noguchi for demonstrating these, the details of which are given in the articles from which these extracts have been made.

These microörganisms are very small, measuring from 0.15 to 0.3 of a micron in diameter. They are grown under conditions which are favorable to the growth of bacteria, but the observers at present have no opinion to offer as to the place which these organisms occupy among living things. Whether the organism is a bacterium or a protozoan has not been determined. What is known is that it passes through a Berkefeld filter, that it is capable of recultivation, apparently indefinitely, and that the organism is identical whether derived from human sources or monkeys. Great difficulties are experienced in obtaining the initial culture, and it is not always possible to demonstrate the organism; even when the organism is grown, it may not possess a sufficient degree of pathogenicity to cause an infection in the monkey. It is possible that there are two factors present in the cultures—one invisible, the other the globular bodies described.

The demonstration of this organism is one of the greatest contributions which has been made to medicine in recent years, and it is highly probable that this will lead to a much better understanding, both of this disease and of others, and may eventually lead to the clearing up of the many mysteries which surround the infectious diseases.

THE TRANSMISSION OF POLIOMYELITIS. There are a few subjects of more practical importance than that of the transmission of poliomyelitis, and, in the very few years during which the disease has attracted attention, a large number of facts bearing on this subject have been collected. At the present time, however, one cannot speak dogmatically on this subject. Rosenau<sup>1</sup> has considered our knowledge on this subject up to the present time. Most of the opinion can be summarized under four headings: (1) That it is a contagious disease communicated directly from person to person through the secretions from the mouth and nose; (2) that it is an insect-borne disease; (3) that it is conveyed through dust; (4) that it is an alimentary infection, the virus being taken in with food and drink and absorbed from the digestive tube. Other views than these have been advanced, especially that it is a disease transmitted to man from lower animals, but up to the present time there has been no very convincing demonstration that the infection occurs naturally in any other animal than man.

<sup>1</sup> Boston Medical and Surgical Journal, September 4, 1913, p. 337.



Among those who believe that the disease is transmitted from person to person, and that in this manner it probably resembles cerebrospinal fever, are Flexner and others, who believe that the virus leaves the body in the nasal and buccal secretions and enters the individual through the nose or mouth. Kling, Petterson, and Wernstedt claim to have demonstrated a virus in the secretions from the nose and throat both during the disease, convalescence, and in healthy carriers. Osgood and Lucas have demonstrated the virus in the mucous membranes of a monkey five and a half months after recovery from the experimental disease, and they found it in a chronic carrier in man. Kling claims to have found the virus in a few human cases as long as seven months after recovery. Experimentally, monkeys have been infected by simply placing the virus upon the uninjured mucous membrane of the nose and throat.

There are several points which need to be carefully considered in this connection, first, that at present it has not been conclusively demonstrated that these cases, which have been produced by placing the virus upon the mucous membrane of the nose and throat, are really a reproduction of the disease as it would occur in nature. These cases must be proved, the virus recovered and be capable of infecting other cases through succeeding generations of the virus. Many competent observers, including Rosenau, Flexner, Anderson, Sheppard, and Amoss, have failed to demonstrate the virus constantly in the secretions from the mouth and nose. If the disease is always transmitted through the secretions, it should be capable of being demonstrated without much difficulty. The virus of the disease is widely diffused throughout the body, and while it is of greatest virulence and, apparently, there is more of it in the spinal cord than elsewhere, it has been demonstrated in many other tissues and organs, so that its being found occasionally in the secretions from the nose and throat is not a remarkable fact even if this is not the usual source of its leaving the body.

The work of the Massachusetts State Board of Health, in mapping out the cases during the past five years, does not seem to bear out the idea that the disease is ordinarily a contact one. It is rural, rather than urban. It does not frequently invade cities, and, when it does, there is no tendency for it to be more prevalent in the congested areas of the city, nor does it have any special tendency to develop in hospitals, jails, asylums, and similar places where the spread of infection by contact is favored as is the case with other diseases which are spread through secretions from the mouth and nose. The disease is more common in the summer months when contact diseases are ordinarily less prevalent, as overcrowding and opportunities for infection are more frequent in winter weather. The curve of the seasonal prevalence corresponds to that of typhoid fever, and the diarrheal diseases. These, and the diseases borne by insects, are the only ones which are generally

found during warm weather. Much of the evidence we have points to the stable fly as the carrier of the disease, and Anderson and Frost<sup>1</sup> were able to transmit the disease experimentally.

They have made a second series of experiments which differ from those first described by them last year. The results of all their second experiments were entirely negative, and no satisfactory explanation for the discrepancy in the results has been advanced. The first experiments, as well as the experiments of Rosenau and Brues, were carried out in the early autumn, during the season when poliomyelitis is quite prevalent in nature. The later experiments were carried out in the late autumn and winter months, during which poliomyelitis is rarely seen under normal conditions. Although there is no obvious reason, if the temperature inside the laboratory is maintained, why season should exact any special influence on the outcome of their experiments; they have determined to repeat their work during the summer and fall.

Sawyer and Herns<sup>2</sup> were led to try some experiments on the transmission of poliomyelitis by means of the stable fly (*Stomoxys calcitrans*) on account of the statements made by Rosenau before the Fifth International Congress on Hygiene and Demography. At the time the announcement was made, there was a severe epidemic of poliomyelitis in certain parts of California. They conducted a series of 7 experiments in which the conditions were varied, and they were unable to transmit poliomyelitis from monkey to monkey by means of the stable fly. The monkeys used in their experiments were kept in roomy, fly-tight cages, and, previous to being placed in the cages, they were given an insecticide bath and the cages were thoroughly cleaned and disinfected. With a few exceptions, they were kept under observation from one to four weeks before beginning any experiments. Laboratory-hatched flies were used, and they were transferred in loads of fifty to wide-mouthed quart fruit jars. These were permanently sealed with a piece of bobbinet, the edges of which were drawn down over the sides of the jar and firmly held by an encircling band of adhesive plaster. The flies were fed by inverting the jars and holding them, until the flies were satisfied (usually from twenty to thirty minutes), against the abdomen and chest of a monkey or rabbit which had been placed on an animal board. Further experimentation may reveal conditions under which the stable fly can readily transfer poliomyelitis, but Sawyer and Herns doubt that the fly is the usual agent in spreading the disease.

Howard and Clark, at the Rockefeller Institute, found that the domestic fly can carry the virus of poliomyelitis in an active state for several days on the surface of the body, and for several hours within

<sup>1</sup> Public Health Reports, May 2, 1913, vol. xxviii, p. 833.

<sup>2</sup> Journal of the American Medical Association, August 16, 1913, p. 461.

the gastro-intestinal tract. Mosquitoes and lice apparently do not take up any of the virus and maintain it in the living state. The bed-bug, however, gave one positive result, the virus remaining alive for seven days after it had been derived from the blood of a monkey. This isolated instance is suggestive, because it would seem that the virus must have increased in the body of the bed-bug, as the virus in the blood of the monkey is in a rather diluted form and requires several cubic centimeters to infect another animal.

That the lower animals are responsible for the disease has not been proved. There are numerous paralytic diseases of the lower animals about which we know nothing. Horses have been supposed to be one animal which have a somewhat similar disease, as I have noted a few years ago in the report by Hill, of Minnesota, and other observers have also associated the disease with the horse. Dogs, cats, and other animals, have also been supposed to be infected with it, but there is at present no definite evidence on this point.

That the disease is borne by dust is possible, but does not seem very probable. The experiments of Neustaedter and Thro are the most important along this line, as they claim to have produced the disease in monkeys by inoculating them with the dust found in the sick-room. The prevention of the disease at the present time must be carried out by using measures to prevent the spread of the disease in every possible way. Screening will prevent the access of insects to patients and isolation will prevent the spread of the disease by direct contact, and disinfection of the sputum and all articles soiled with it, and the suppression of dust in the sick-room will look after the other two possibilities, so that, in any event, it would seem that by taking these precautions the spread of the disease could be greatly limited.

In connection with the above, it is interesting to note the opinions of Kling and Levaditi<sup>1</sup>. After quite a large series of observations concerning the transmission of the disease, they are of the opinion that all the facts point to the disease being transmitted by human contact, which is the hypothesis of Wickman. They also believe that the disease is most frequently spread, not only by the typical cases, but by abortive forms which are often unrecognized, and consequently not isolated. When the disease appears in isolated places, it begins suddenly, spreads rapidly, and, after a very short time, tends to disappear completely. They are of the opinion that the incubation period in man may be very short, probably two or three days. They also are of the opinion that patients are capable of transmitting the disease during that part of the incubation period which precedes the appearance of symptoms. They found no confirmation, whatever, of the opinion that the disease is transmitted by water, milk, dust, or ordinary flies, fleas, or mosquitoes.

<sup>1</sup> *Annales de l'Institut Pasteur*, September 25, 1913, No. 9, p. 719.



As concerns the stable fly, *Stomoxys calcitrans*, they believe that the relation of this insect, as regards the transmission of the disease, is not definitely settled. They confirmed the opinion held by most investigators that man appears to be the only depositor of the virus, and that the virus is contained in the secretions of the nasal pharynx and trachea, and also in the intestinal tract.

One of the instances of demonstrating the virus of poliomyelitis in the human being is found in a report made by Flexner, Clark, and Fraser.<sup>1</sup> At present the only criterion of the presence of the virus is to produce the disease in monkeys. The authors just mentioned have been able to do this in the parents of a child who was suffering with typical poliomyelitis. The nasal pharynx was irrigated with about 150 c.c. of normal salt solution and the fluid well shaken and pressed through a Berkefeld filter. This was injected into the sheath of the sciatic nerve of a *Macacus cynomologus*. This animal developed the disease typically and, by using emulsions from the central nervous system, it was possible to reproduce the disease in all other monkeys. This experiment, of course, leaves no doubt of the possibility, sometimes at any rate, of finding the virus in the upper air passages.

THE SELF-LIMITATION OF POLIOMYELITIS. It has been well known that there are variations in regard to the susceptibility to poliomyelitis, and also in regard to the severity of the attack, just as is the case with other infectious diseases. Kling and Levaditi<sup>2</sup> have made some studies in regard to the reason for this apparent variation, and they found that the serum of patients who had, or who have had, the disease, either destroys or neutralizes the virus. Mixtures of virus and serum were injected into the monkeys, and serum was also used from children who had been exposed to the disease but who had remained perfectly well. In two of these, complete protection was afforded; in 5, partial protection and in 2, none at all. They suppose that some children have a natural immunity or that it may have resulted from a late infection which never develops to such an extent as to be recognized, that is, that these cases of children who resist the disease really have an acquired immunity. Further experiments will be necessary to prove whether the immunity is inborn or whether it is acquired. If their assumption is true, it is quite probable, in a certain number of cases, that the population is rendered more or less immune to the disease, which may account for the periodicity of the epidemics.

AN OUTBREAK IN TEXARKANA. Outbreaks of poliomyelitis have excited considerable interest, and there is one which occurred last year which was studied by Francis.<sup>3</sup> The outbreak consisted of 143 cases, 50 of which were in Texarkana, and many cases occurred in the

<sup>1</sup> Journal of the American Medical Association, January 18, 1913, p. 201.

<sup>2</sup> Annales de l'Institut Pasteur, 1913, vol. xxvii, p. 538.

<sup>3</sup> Public Health Reports, August 12, 1913, p. 1693.

families of farmers or in many cases in families living under farm conditions. One point of interest is that the outbreak occurred in the early summer. One hundred and twenty-four of the cases had their onset within thirty days, beginning May 20 and ending June 18, the greatest number of cases being noted on the first day of June. Most of the cases occurred under five years of age, 15 under one year, 36 between one and two, and 29 between two and three. The legs are more frequently paralyzed than the arms, and the muscles of deglutition were involved in 72 cases, 5 of which resulted fatally. The methods used for preventing the spread of the disease consisted in reporting the cases to the health officer, the confinement to a compartment thoroughly screened against flies for a period of three weeks from the onset of the disease, confining to the premises, during the quarantine period, all members of the family except the bread-winner, and the exclusion of all visitors. In addition to these regulations, disinfection of clothing and eating utensils, and a terminal disinfection of the house with formaldehyde were practised.

**A NEW PREPARALYTIC SYMPTOM OF POLIOMYELITIS.** Colliver<sup>1</sup> has noted a symptom which he has found in 16 cases of poliomyelitis, and which he believes to be characteristic of the preparalytic stage of this disease. The symptom referred to is a peculiar twitching, tremulous, or convulsive movement of certain groups of muscles, lasting from a few seconds to less than a minute. He states that the amplitude of vibration is greater than a tremor, not so constant and long as a convulsion, and more regular than mere twitching, yet it has some elements of all of these. It generally affects a part, or whole, of one or more limbs, the face or jaw, and it may sometimes affect the whole body. The symptom may easily be overlooked in the beginning, as it usually lasts less than a second, and, unless the patient is disturbed, does not recur oftener than an hour or so. Later, the duration of the spells lengthen to a few seconds, and recur at shorter intervals. Sometimes there is a peculiar cry similar to that heard in hydrocephalus, and at times there is slight convulsive movement like a chill, in which the child apparently loses consciousness for a few seconds, and then becomes normal again. I have noted this symptom in a number of cases of poliomyelitis and I believe it has some value in making the diagnosis, but I am not at all sure that the same phenomena does not occur in cerebrospinal fever which, unfortunately, is one of the diseases which has to be separated from poliomyelitis.

**THE POLYNEURITIC FORM OF POLIOMYELITIS.** Although it has generally been assumed that there is a true polyneuritic form of poliomyelitis, the evidence of this is based largely on clinical observations rather than on exact pathological studies. It is therefore of particular

<sup>1</sup> Journal of the American Medical Association, March 15, 1913, p 813.

interest to note the case reported by Leopold.<sup>1</sup> The patient was twenty years of age. She was admitted to the hospital after an illness of seven days, beginning with nausea, vomiting, and fever, and accompanied by severe pain in the back of the head and neck. A few days later there were pains and paralysis in both legs, especially the left. There was pain on pressure over the nerve trunks, and some swelling of the left knee-joint. Subsequently, there was paralysis of the bladder. The patient died two months after the onset, and at the autopsy it was found that in the lumbar region of the spinal cord there were changes suggesting an acute poliomyelitis in the reparative stage. The anterior horns were practically destroyed, there was an intense inflammation in the meninges about the posterior roots, and there was an inflammatory exudate in the spinal roots. The changes in the peripheral nerves were probably secondary in character. Unfortunately, only one nerve could be examined. The pain on pressure could easily be explained by the inflammation in the meninges and the swelling about the spinal roots. This case seems to bear out Wickman's opinion that the peripheral nerves are not involved, and that the pain is due to the meninges. It is only under exceptional circumstances that the nerves of the cases which suggest a polyneuritis clinically, can be subjected to careful study, and I would suggest that anyone having such a case coming to autopsy, would take particular efforts to get not only the peripheral nerves, but the spinal cord and nerve roots as well for pathological study in order that this question may be cleared up.

CEREBROSPINAL FLUID IN POLIOMYELITIS. Fraser<sup>2</sup> has made a study of cerebrospinal fluid in 126 cases of poliomyelitis, including some 362 separate examinations. The spinal fluid in acute cases was usually clear and colorless, and did not seem to be under any great increase of pressure. There were variations from the normal fluid, however, in that there were changes in the cells present or in the globular content, or in both, and these changes occurred on the first few days after the onset of symptoms. As a general rule, the increase in the cells was greatest during the first week, and, in one instance, there were as many as 1221 cells per cubic centimeter. On the other hand, the globular reaction was generally most intense during the third week, and by this time the number of cells had diminished and was greater than normal in only 32 per cent. of the cases. The increase in the globulin reaction persisted to the fourth week, although it may be present much longer. The increase in the cells was almost always in the meninges, generally in the lymphocytes, but in the very early stage there was a high polynuclear count. All of the fluids reduced Fehling's solution. Flexner is of the opinion that while the examination of the fluid may be of value in diagnosis in abortive cases and before paralysis comes

<sup>1</sup> American Journal of Medical Science, September, 1913, p. 406.

<sup>2</sup> Journal of Experimental Medicine, September, 1913, p. 242.



on, it has no value in prognosis, either as regards life or ultimate recovery.

**POLIOMYELITIS WITH ICTERUS.** In 1910, Guillian and Richet reported 3 cases of a disease in which the chief symptom suggested meningitis, and in which there was marked icterus. Pignot<sup>1</sup> has recently reported his observations on the blood of these three subjects which were studied with the neutralization method of the virus of poliomyelitis, as suggested by Netter and Levaditi. Experiments were made upon four monkeys, one of which was used as control, and three others were inoculated. Two of these showed no lesions of poliomyelitis, while the third developed symptoms of the disease. It was thought from these experiments that these patients had in their blood, thirty-six months after the disease, the antibodies of poliomyelitis, which suggests that very probably many of the obscure conditions suggesting meningitis which have been observed of recent years really belong to the cerebral forms of poliomyelitis.

**POLIOMYELITIS AND DOGS.** Langhorst<sup>2</sup> has advanced the idea that the dog is subject to the bite of the stable fly and that it may become infected with poliomyelitis and act as a reservoir for the virus. He reports two instances in which he believes the disease was transmitted from the dog to the human being. In one instance, the patient was licked on the hand by a dog that had some paralytic affection, and in the second instance the child was bitten by a dog. The evidence in both of Langhorst's cases is rather questionable, and, until the dog is proved to be a reservoir of poliomyelitis, one hesitates to consider this animal as a factor in the spread of the disease.

**PARALYSIS IN A DOG SIMULATING POLIOMYELITIS.** As is well known, the association of paralysis in animals has been noted at the time of epidemics of poliomyelitis. Paralysis is not an infrequent symptom, particularly in dogs, and an observation by Flexner and Clark<sup>3</sup> on a dog developing paralysis is of interest, inasmuch as the disease clinically resembled poliomyelitis quite closely, as it is seen in children, and the autopsy showed changes in the spinal cord and intervertebral ganglia which resembled, but which were not identical with, the lesions of poliomyelitis in man. Inoculations of the affected spinal cord into the nervous system of young dogs and *Macacus rhesus* monkeys was not followed by the production of paralysis, or other obvious symptoms of disease. It seems quite probable that many of these cases which suggest poliomyelitis will be found, on investigation, to be some other affection, and, from the evidence which we now have, it seems highly probable, although not entirely certain, that there is little relation

<sup>1</sup> *La Semaine Médicale*, November 12, 1913, p. 550.

<sup>2</sup> *Journal of the American Medical Association*, December 28, 1912, p. 3212.

<sup>3</sup> *Journal of Experimental Medicine*, 1913, vol. xvii, p. 577.

between epidemic poliomyelitis as it occurs in man and any disease of the ordinary domestic animals.

**POLIOMYELITIS IN GUINEA-PIGS.** Roemer noted that guinea-pigs in his laboratory frequently died of a paralysis which is very similar to that of poliomyelitis. He found that the cause of this paralysis was a non-bacterial filterable virus, which can be transmitted from guinea-pig to guinea-pig, and which, after an incubation of nine to twelve days, caused a flaccid paralysis, usually of the hind legs, with involvement of the bladder. The microscopic changes were similar to those seen in poliomyelitis in man.

Neustaedter<sup>1</sup> injected six guinea-pigs, starting with an emulsion of the spinal cord of a monkey that suffered with poliomyelitis of a very high virulence. The first two pigs died, and the third was inoculated with the emulsion of the cord from the first one by rubbing the virus into the mucosa of both nares. Pig number four was inoculated in the same way, and, as a control, the sixth animal was swabbed over the nasal mucosa with the filtered virus of the cord of a monkey that died of poliomyelitis. All of these animals died from symptoms which corresponded to poliomyelitis, and, macroscopically and microscopically, the lesions in the cord were similar to those found in other animals. It seems highly probable that the guinea-pigs of Roemer and also of Neustaedter died of poliomyelitis, but these experiments will have to be reproduced before one would like to draw any very definite conclusions.

**Rabies.** **THE CULTIVATION OF THE PARASITE OF RABIES.** The history of rabies is one of the most interesting pages in the history of the infectious diseases. The infectious nature of the disease was first noted by Galtier in 1879, and this was followed by the brilliant researches of Pasteur after which nearly a quarter of a century passed without any very important additions to our knowledge of the subject. In 1903, Negri described the inclusions in ganglion cells which are generally spoken of as the Negri bodies, and numerous other writers have noted their discoveries of minute granules of various kinds in the central nervous system of animals which had died of the disease. Among these may be noted Babes, J. Koch, Volpeni, and Proeschner. Their work has been reviewed in previous volumes of *PROGRESSIVE MEDICINE*. Following closely after Negri's work, Remlinger demonstrated that the virus could be passed through the pores of a fine Berkefeld filter, and his observations have been confirmed more recently by Poor and Steinhardt. All efforts to cultivate the virus have failed until the brilliant work of Noguchi.<sup>2</sup> He applied his method for cultivating the spirochetæ, the general method of which is outlined in this article under the heading of poliomyelitis. Some 50 series of cultivations were

<sup>1</sup> Journal of the American Medical Association, March 28, 1913.

<sup>2</sup> Journal of Experimental Medicine, September 1, 1913, p. 314.

made with the brain and medulla removed aseptically from rabbits, guinea-pigs, and dogs infected with "street virus" and "fixed virus." In most instances, the animals were etherized just before spontaneous death occurred. In these cultures, there developed very small granular and pleomorphic chromatoid bodies, and these bodies reappeared in new cultures on subsequent transplantation into new tubes, and this may be continued through many generations. The appearance of these bodies is apparently the same whether obtained from "street or fixed virus." The smallest of these bodies are just on the limit of visibility with the Zeiss apochromatic 2 mm. lens. On several occasions the cultures contained nucleated, round, or oval bodies surrounded with membranes totally different from the smaller granular bodies, although they appeared in the cultures in which the latter were observed. They appeared suddenly, remained visible for four or five days when they diminished in number, and at the same time there was an increase in the granular bodies. Rabies has been reproduced in dogs, rabbits, and guinea-pigs by inoculating cultures containing the granular pleomorphic or nucleated bodies. The disease so produced corresponds to rabies in its symptoms, and subsequent positive animal inoculations confirm the accuracy of the diagnosis. From the brain of these animals, film preparations always contain the granular, and sometimes the nucleated, bodies in large numbers.

Williams,<sup>1</sup> in commenting upon Noguchi's work, again calls attention to a method which she has used successfully in passing the virus from culture to culture. The method is one which she devised for obtaining pure cultures of ameba from amebic dysentery. A thin slice of fresh sterile guinea-pig's brain was placed on freshly made protozoan agar plates over a piece of rabbit "fixed virus brain the size of a pea." This was then covered with a thick layer of protozoan agar, and kept at 25° C. This material was transplanted at the end of seven days by removing the agar, stirring up the mass, and transferring about one-fourth of it to a fresh agar plate, and proceeding as before. After this was done, a portion of the mass was used to inoculate guinea-pigs, and up to the fourth culture it was possible to produce the disease. After that, the material was contaminated, and the animals did not develop rabies. This, of course, is suggestive, but does not rule out the possibility of merely a dilution of the original virus. Another piece of work on the virus of rabies is that of Poor and Steinhardt.<sup>2</sup> They devised two methods for obtaining the virus freed from the cells of the host, and from other contaminating organisms, by taking the salivary glands of infected dogs. The first method consists of the extraction of the glands with glycerin, and the second by subjecting the glands in distilled water to a vacuum of 29 inches of mercury for an hour. The

<sup>1</sup> Journal of American Medical Association, October 25, 1913, p. 1509.

<sup>2</sup> Journal of Infectious Diseases, 1913, vol. xii, p. 202.



fluid thus obtained contains the virus after filtration through Berkefeld filters. This virus contained no formed elements, but only very small granules. Whether this material can be used for growing the organism, according to Noguchi's method, or not, is not known at the present time.

There have been a number of reports in which the authors claim to have cultivated the rabies organism and to have produced typical rabies in animals from using these cultures. Unfortunately, these reports have not been verified by other observers. Among these may be mentioned the work of Bruschetti, in 1896; of Levy, in 1903; and Sormani, in 1903.

THE NEGRI BODIES IN RABIES. In 1903, Negri described certain bodies contained within the nerve cells of the central nervous system in cases of rabies, and since that time there has been considerable discussion of their significance. In something over 98 per cent. of cases dying with the clinical symptoms of rabies, these bodies may be demonstrated in the cortex of the cerebrum and cerebellum, in the hippocampus major, or in the corpus striatum. There seems to be no doubt that these organisms are constantly associated with rabies, and there are two opinions concerning them: one, that they are simply cell degenerations caused by the rabies virus and incapable of producing the disease, while another group of investigators believe the bodies are definite organisms and the cause of the disease. Quite a number of pathologists in this country believe that the Negri bodies are of a protozoan nature, and Watson<sup>1</sup> believes that the organism belongs to the Microsporidia and has worked out a life history which is of considerable interest.

The Negri bodies are oval in shape, sometimes round or rather irregular. At times they resemble an organism that is budding. They vary considerably in size from 0.25 to 0.5, and even to 21, microns and various sizes may be present in any one animal. The number also is exceedingly variable, sometimes they are very numerous and may be found promptly, and at other times they have to be searched for some minutes. They are found only in the nerve cells. Within the bodies themselves there are small inclusions which are chromatin in granules. These are a constant part of the typical Negri body and they take a dark, slate-blue stain with all dyes which have methylene blue or hematoxylin as a base. These granules vary in number, but there is usually one slightly larger that stains easier than the rest, and this has been regarded as a nucleus; sometimes the other granules are arranged around the central nucleus in such a manner as to suggest nuclear fragmentation, such as might be preparatory to a subsequent division of the cell.

Williams and Lowden have described the stages, growth, and repro-

<sup>1</sup> Journal of Experimental Medicine, January, 1913, p. 29.

duction of this type of Negri body, in which they have demonstrated the division representing the stage of multiplication. Watson and others believe that this fission stage is supplemented, either within the body of the host or elsewhere, by another cycle of a different nature, this other cycle being concerned with a sexual reproduction. In two instances, Watson believes that he has observed a second cycle, and specimens were taken from dogs that had died of a disease suspected to be rabies. The animals were buried, and several days elapsed before they were dug out in order that the heads might be sent to the laboratory for examination. In both cases, the typical Negri bodies were found and, in addition, there were certain forms quite different but closely associated, sometimes being in the same cell with the ordinary form. These new bodies varied considerably in size between 0.25 and 0.5 of a micron. There were evidently some even smaller, but it was extremely difficult to identify them.

The protoplasm of these granules stains with no indication of a nucleus or of chromatin granules. In one end there was a small refractive area which took the stain less readily than other portions, and this small body had the general appearances of a spore. Larger forms than this were also observed which include a definite cell membrane containing from 8 to 10, and sometimes 12, of the spore-like bodies, and some larger forms than these showed an ectoplasmal rim with the spores protruding, and some even quite outside the body itself and in the substance of the nerve cells. In still larger forms, the membranes surrounding them become less distinct, and sometimes the rim is lost entirely. The spores tend to remain close together, but, after the rim has entirely disappeared, there is a tendency for them to push away from the centre. The later stages of the development show the spores occupying a much larger area and much further removed, but the final step in the dissemination of the spores is seen when the circle has been broken up, and, in certain nerve cells, they are seen scattered diffusely over the field. When compared to other, better known forms of the suborder of the microsporidia, it is seen that the resemblance is very close.

**A SIGN OF RABIES.** There have been comparatively few original contributions on the symptomatology of rabies since those of Pasteur. Wesson,<sup>1</sup> however, has called attention to the development of the paralysis, which may be noted in both man and animals, and the initial site of the paralysis in the left hind leg. Wesson has noted this symptom in the left leg of a man who developed rabies. The patient was seen when the disease was well developed; he had a strong grip in his right hand, but only a weak grip in his left; upon attempting to walk, while he had perfect control of the right leg, his left leg gave way under him and he had to be supported on that side. This sign needs a great deal

<sup>1</sup> Journal of the American Medical Association, April 5, 1913, p. 1069.

more study to determine its actual value, but it is worth bearing in mind in considering cases in which the diagnosis of rabies is probable.

**THE EFFECT OF PHENOL ON RABIES.** Another method of treating developed hydrophobia, which it is strange has not met with more general trial, is the use of phenol (carbolic acid), after the method of Baccelli, as used in tetanus. Haberland<sup>1</sup> treated one case that developed rabies five weeks after having been bitten by a rabid dog. He used 10 c.c. of a 1 per cent. solution injected into the subcutaneous tissues of the abdominal wall by the means of an Ehrlich-Hata syringe. The first dose was given at 8.30 P.M. At 9 P.M., 10 c.c. of a 2 per cent. solution were given, and this was repeated one hour later. At 11 P.M. there was very marked improvement in the patient's condition, and the phenol was administered in 10 c.c. doses of a 1 per cent. solution every hour until 8 A.M. In the total of 11 doses  $1\frac{1}{2}$  grams of pure phenol were given. At 2 A.M., six hours after beginning the treatment, the patient became sleepy, and when aroused was able to swallow. The patient was up and about four days later, and on the sixth day was able to get back to his work. Both this method or the quinine treatment, should be given a thorough trial to determine their exact value.

**THE EFFECT OF QUININE ON RABIES.** The hopelessness of developed rabies makes it necessary to investigate any method which promises any hope of saving even a small number of cases. For some unknown reason there has been very little experimentation along this line, or at any rate very little that has been reported. Moon<sup>2</sup> has tried the effect of quinine given hypodermically in dogs. Of 3 animals treated by his method, two are alive and healthy, and one died of some obscure cause two months after the treatment. In every instance, the control animals died with characteristic symptoms of rabies, and the disease was demonstrated pathologically. The methods used for inoculation were such that it would seem impossible for the animals to have escaped infection. The dogs in question developed active symptoms of the disease, and they were then given quinine in capsules around which a small amount of tough meat was sewed. If the dog was unable to swallow these, the drug was given hypodermically, and for a dog weighing 6 or 7 kg. the dose used was 1 to 1.6 gram, usually in 6 doses. The equivalent of this for the average-sized man weighing 150 pounds, would be from 12 to 18 grams a day.

This looks exceedingly encouraging, and Harris<sup>3</sup> has had occasion to treat one case in man. Harris' report includes 7 fatal cases in which the quinine was not tried. The patient to whom it was given, apparently with success, was a white man, aged seventy-three years, an itinerant umbrella mender, who came to the laboratory August 29, 1913, for

<sup>1</sup> New York State Journal of Medicine, September, 1913, No. 9.

<sup>2</sup> Journal of Infectious Diseases, July, 1913, p. 170.

<sup>3</sup> Journal of the American Medical Association, October 25, 1913.



advice about an old dog bite. He had been bitten five or six weeks before on the right leg, and for the past four or five days there had been a great deal of pain in the wound. He had not been able to sleep, had not been able to swallow for two days without becoming choked. Attempt to drink water produced pharyngeal contraction. He was nervous and anxious. He was urged to enter the hospital, but refused to do this immediately. After having attempted to drink a great deal of whisky, most of which was not swallowed, he was in the condition of acute alcoholism at the time of admission. At 5 P.M. he was given 1 gram of quinine and urea hydrochloride in 3 c.c. of sterile salt solution. This was given intravenously, and repeated at 7 P.M., 9 P.M., 11.30 P.M. and on the next day at 9.45 A.M. and 11.30 P.M., making a total of 6 grams within twenty hours. Following the second injection at 7 P.M., the patient said that all the pain in the thigh and over the area of the bite had disappeared, and a little later he drank 6 ounces of milk without difficulty and an equal amount at 11.30 P.M. On the following day he drank 6 ounces of milk, 6 ounces of coffee, and ate 2 crackers and a slice of bread. The following night he was given 4 grams of paraldehyde which was repeated at once. He slept at intervals throughout the day and at night, and there was no return of the symptoms. He was discharged four days after his admission.

Nine hours after the fourth injection of quinine and urea, a lumbar puncture was made, and 25 c.c. of clear cerebrospinal fluid were withdrawn. This was injected subdurally into two rabbits and guinea-pigs, and also in the region of the cervical plexus of three guinea-pigs. After thirty-five days, none of these animals showed any symptoms of rabies. The failure of these animals to develop rabies is in no sense a proof that the disease in question was not rabies, as it has been noted that the cerebrospinal fluid, if free from cells, will rarely produce the disease. The very prompt effect of the drug strongly suggests the possibility of an error in diagnosis, but, in view of the results that have been obtained by Moon, this method of treatment should be tried out immediately by everyone having to do with rabies.

**The Transmission of Relapsing Fever.** Very few contributions have been made on the subject of how the spirillum of relapsing fever is transmitted from one patient to another. Tictin, in 1897, following up an idea that was popular in Russia, was able to produce the disease in monkeys by means of fleas recently fed on patients suffering with the disease. The fleas were not allowed to bite the monkeys, but subcutaneous inoculations were made of the digestive tract of these insects, or by rubbing the bodies of the fleas on excoriated surfaces of skin. Karlinsky, in 1903, found the spirillum in a flea thirty days after feeding upon a patient. Following these two observations, a number of negative reports were made, and Nuttal, experimenting with the spirillum of relapsing fever and also *S. duttoni*, made the observation

that they do not survive more than seven hours in the digested food of fleas. The body louse as a possible carrier of the disease, was suggested by Mackie, in 1908, subsequently by Graham Smith in 1907, and Bousfield in 1911, and in the same year by Sergeant and Foley.

Nicolle, Blaizot, and Conseil<sup>1</sup> have contributed rather an extensive article on this subject in which they outlined their numerous experiments made during an epidemic of the disease that occurred in Tunis and Algeria. As a result of their studies, they believe that epidemics of relapsing fever follow the same course as those of typhus fever, and that the agent of transmission is probably the same in both instances, that is, the body louse. The louse has been suspected, but those insects that had been fed upon patients suffering with relapsing fever, apparently were harmless, and this was borne out by careful experiments covering some 6000 bites. It was found that the spirillum rapidly disappeared in the body of the louse, but that this disappearance was only apparent, for after eight days they again appeared and persisted for a period of about twelve days, and then disappeared entirely. These new spirilla are virulent for man and for monkeys, and are localized in the lacunar cavity of the louse and do not get into the mouth or the digestive tube. If the louse be crushed and rubbed on excoriations of the skin, the disease may develop in either man or monkeys. This could easily happen by the insects being crushed, the finger nails becoming soiled with the contents of the body and then inoculated into the skin, either by scratching or rubbing into the conjunctiva. Similar experiments have succeeded with the head louse as well. It seems highly probable that other diseases due to infection by a spirillum may be transmitted in the same manner.

**The Treatment of Rheumatism by Baccelli's Method.** Carlo<sup>2</sup> has reported a successful case of rheumatism complicated with cerebral symptoms treated by Baccelli's method, which consists in the intravenous injection of bichloride of mercury. This method has been used in various complicated cases of articular rheumatism, particularly in those in which there is endocarditis, as reported by Singer, Maraliagno, and others.

The case described by Carlo is in a young man, twenty-six years of age, who developed an acute articular rheumatism. On the twentieth day, he began to show great restlessness, later became delirious and showed very marked cerebral symptoms. The patient's condition became extremely grave, and it was decided to try Baccelli's method. On the first day he was given 2 mgm. of bichloride; on the second day, 3 mgm.; on the third,  $\frac{1}{2}$  cg.; and on the fourth, 1 cg. The injections were very well borne by the patient and, in all, six injections were given, after which the patient was apparently out of danger. Altogether,

<sup>1</sup> *Annales de l'Institut Pasteur*, March 25, 1913, vol. xxvii, p. 204.

<sup>2</sup> *Il Policlinico, Sezione Practica*, October 5, 1913, p. 1448.

the patient was given 30 mgm. in six days, which was borne very much better than could ordinarily be expected.

**Scarlet Fever.** SECOND ATTACKS OF SCARLET FEVER. Lammerhirt<sup>1</sup> made a report on this subject from a practice which afforded an experience of from 30 to 50 cases of scarlet fever a year. In the course of ten years, he observed 3 cases in which the same patient had the disease a second time. The first case was a child who had the disease in 1903, at the age of two years. At this time, there was a typical angina and exanthem. At the end of a year and a half he had a second attack of the disease, from which he died on the fourth day, while his brother six months of age, who also had the disease at this time, finally recovered.

The second case was that of a boy, aged eleven years, who, in 1912, had an intense scarlatiniform eruption and angina, and, later on, typical desquamation. The mother who nursed the child was also taken with typical scarlet fever. This boy had had, eight months previously, a very severe scarlet fever, the diagnosis of which was made from information furnished from the parents, to the effect that there was an intense angina and swelling of the cervical lymph nodes, a marked exanthem, and, later on, desquamation.

The third case was that of a boy of twelve years, who during the month of June, 1913, was taken with scarlet fever, with high temperature, characteristic eruption, sore throat, and desquamation. The mother and sister of the patient also had the disease at this time. The same boy had had, in 1907, a serious typical attack of scarlet fever, at which time he was under the care of another physician.

These observations, Lammerhirt thinks, tend to prove that immunity to scarlet fever is not always perfect, and that having had the disease once is not guarantee that one may not have a second attack, and even a fatal outcome from the second attack. Of course, one realizes that in any infectious disease the immunity, for some unknown reason, may not be perfect, and may not be lasting. At the same time, those who have had a large experience with scarlet fever feel that the immunity from this disease is, as a general rule, as perfect as is found in any of the infections, and second attacks of undoubted scarlet fever are certainly exceedingly rare. The diagnosis of eruptive fevers, particularly scarlet fever is often a matter of great difficulty, and undoubtedly many of the so-called second attacks of scarlet fever are not scarlet fever at all, but some other disease with a sore throat and an eruption.

**SCARLET FEVER IN INFANTS LESS THAN ONE YEAR OF AGE.** There can be no question of the gravity of scarlet fever when it occurs in very young children, and some interesting facts on this subject have been furnished by Axenov.<sup>2</sup> During the period from 1907 to 1911, there were admitted in the Municipal Hospital for Children in St. Petersburg,

<sup>1</sup> Medizinische Klinik, September 14, 1913.

<sup>2</sup> Vratch, October 6, 1912, La Semaine Médicale, April 9, 1913.



11,481 cases of scarlet fever. Of this number, 524 were less than one year of age, and these constituted 4.6 per cent. of the total number of cases. Of these 524 children, 261 died, or nearly 50 per cent. Of these 524 cases, 271 (53 per cent.) were boys, and 246 (47 per cent.) were girls. Of the boys, 149 died, a mortality of 53.6 per cent.; of the girls, 112 died, a mortality of 45.5 per cent. This same relation of mortality to sex was also noted in older children in St. Petersburg. Of the 524 cases, during the first three months, there were 10; during the second, 83; during the third quarter, 173; and in last quarter of the year, 258 cases. The mortality for infants under six months of age was somewhat less than in the older infants.

During the first seven to ten days of the disease, these children all lost weight rather rapidly, and, in the uncomplicated cases, when the temperature reached normal the body weight commenced to increase, but very slowly. Toward the end of the third week and the beginning of the fourth, the infants had regained their initial weight. The weight curve presented certain features of great value in prognosis. When there was no tendency for the child to gain weight, the prognosis was unfavorable and where there was a rapid elevation early it was almost a certain premonitory sign of nephritis. In general, in the older children the period lasted six or seven days, while the period of desquamation was, on an average, thirty-three days. In the infants under consideration, the average duration of the exanthem was five days, and the period of desquamation from two and a half to three weeks, and only in 13 per cent. did the desquamation last five weeks. In the older children, the period between the eruption and the beginning of desquamation was about two and a half days, while in the young infants this period was about eight days. Complications were particularly frequent, only 20 per cent. of the cases being free from them. In the order of their frequency was lymphangitis in 70 per cent. of the cases, otitis in 31.5 per cent., gangrenous angina in 20.4 per cent., nephritis in 2.5 per cent.

**THE THYROID IN SCARLET FEVER.** It has been observed that sometimes, in the course of acute infectious diseases, there are marked changes in the thyroid gland, but there have been very few researches made on this subject, so that the report of Gregor,<sup>1</sup> who made a study at the Municipal Hospital for Children in St. Petersburg, is of special interest. He examined 26 cadavers, of which 21 had scarlet fever, 5 others were used for controls, two being bronchopneumonia, one enterocolitis with nephritis, one measles with pneumonia, and one case of traumatism.

The thyroid gland in the scarlet fever cases showed a red colored section and, under the microscope, the vessels of the capsule were dilated and filled with blood, and here and there were minute hemorrhages. There was an increased amount of blood in the parenchyma of the gland, not only were the vessels dilated but also the capillaries of the

<sup>1</sup> *Pediatrics*, April, 1913; *La Semaine Médicale*, October 15, 1913, p. 496.

follicles. In some places, there were minute emboli in the capillaries, and some of the sections showed the presence of streptococci. In some instances, there was hypertrophy of the connective tissue, but this change was not constant. There were marked changes in the parenchyma, the cells sometimes degenerated, the nuclei varied in size and shape, with irregular staining reactions, and, in most of the sections, there was a desquamation of the epithelium of the follicles. It is difficult to judge changes taking place in the colloid substance, but apparently there was some diminution in the amount.

Gregor concluded from his observations that there exists a scarlatinal form of thyroiditis, and he raises the question whether or not these changes may not have some relation with the development of disease in the thyroid in later life, particularly with reference to exophthalmic goitre.

In this connection, it is interesting to note the observations of Saint-Girons.<sup>1</sup> He reported 2 cases of myxedema following acute infections in children. The first was in a child who had severe measles at ten years of age. Up to this time his development was normal, but, after the attack, he ceased to grow, and there were more or less characteristic changes, such as are seen in myxedema. He had sufficient intelligence to engage in business, but, at thirty-six years of age, he presented a complete picture of myxedema. His general condition was much improved by thyroid medication. The second case at the age of eight and a half years was attacked with the disease which, from the description, was evidently acute articular rheumatism. The patient ceased to grow, and, at the age of thirteen, a second attack of some joint affection accompanied with marked articular rheumatism caused the child to be bedridden. The following year he presented a typical picture of myxedema. In both instances, it is highly probable that the changes in the thyroid gland were due to the infection.

THE INCLUSION BODIES IN SCARLET FEVER. I noted last year the observations of Dohle, of Kiel, who found certain small bodies in the protoplasm of the polymorphonuclear leukocytes in the blood of scarlet fever patients. Since his first announcement, there have been numerous studies made on this subject, especially in Europe, and also a few in this country. Practically all of the observers, with a few exceptions, are of the opinion that these bodies are of little value in diagnosis. Bongartz, in 80 cases, found the inclusion bodies in 81 per cent. of normal blood and in 9½ per cent. of the others, the latter observations being made on scarlet fever, diphtheria, measles, whooping cough, and diarrhea. Glomset states that the shaking up of normal blood increases these bodies.

Granger and Pole,<sup>2</sup> of London, find that a carbolmethyl blue stain

<sup>1</sup> *La Semaine Médicale*, October 15, 1913, p. 497.

<sup>2</sup> *British Journal of Children's Diseases*, January, 1913.

gives better results than the Manson stain, and they believe that the inclusion bodies will probably be found in every true case of scarlet fever during the first four days, and that the absence of these bodies practically excludes scarlet fever. They do not believe that finding them is a help in the differential diagnosis of scarlet fever, as they claim to have observed them in cases of diphtheria, measles, and tonsillitis. Four observers have found Dohle's bodies to be of value in diagnosis. These are Kretschmer, of Berlin, Kolmer, of Philadelphia, and Nicoll and Williams, of New York.

Nicoll<sup>1</sup> has recorded the results of his and Williams' work. After reviewing briefly the observations of other authorities, he states that he believes the differences of opinion must be accounted for on other grounds than incompetence or prejudice on the part of those making the reports. He believes that the reason for these differences is that the majority of workers have chosen to record a given case as positive if, after prolonged search, one or two leukocytes show a single body of whatever size or shape. It is perfectly true that if a great many cells are examined in normal blood, inclusions may be met with. To determine this point, Nicoll studied the blood from 20 supposedly normal children, and, by examining 100 or more leukocytes in each case, found inclusions in two of the cases, one inclusion in each case. Nicoll also believes that many of the discrepancies have been from the examination of blood smears sent out of the laboratory without clinical data of the illness from which the patient suffered. He firmly believes, on first studying the inclusion bodies, that every case of true scarlet fever, up to and including the fourth day, would show a sufficient number of the bodies to justify a differential diagnosis, but recently he has had to change his opinion after a study of 33 mild, atypical cases, all of which were carefully examined, and 5 of which showed too few inclusions to justify calling the blood-smear positive. He believes that, in a small percentage of true scarlet fever, negative results may be expected, and that a certain class of cases, particularly sepsis, whether due to surgical or accidental traumatism or complicating some disease, show a similar blood picture to scarlet fever. Serum rashes, however, do not show any inclusions, or only as they might be found in normal blood, so that negative findings practically excludes the presence of scarlet fever. The same is true of toxic rashes and German measles, both of which are often mistaken for scarlet fever.

The blood from measles is peculiar. Nicoll had an opportunity of examining 40 cases of the uncomplicated form in the preëruptive stage to the first week, and not one had a blood picture similar to that of scarlet fever, although there were regularly present, in the polymorphonuclears, tiny granules which were quite unlike the relatively

<sup>1</sup> Archives of Pediatrics, May, 1913.



large masses found in scarlet fever and in acute follicular tonsillitis, which is unfortunately a disease which has to be considered in the differential diagnosis. Nicoll has not made a sufficient number of examinations to justify conclusions, but, in the cases which he examined, no inclusions had been found. The finding of typical inclusion bodies in a case resembling scarlet fever before the fourth day of the disease may mean scarlet fever, septicemia, or a severe streptococcus angina. Negative findings practically exclude the presence of scarlet fever.

In the course of diphtheria for which antitoxin has been given, positive findings before the seventh day are not diagnostic of scarlet fever. After this time, a positive finding in the presence of a scarlatiniform rash should make one suspect, very strongly, the existence of a complicating scarlet fever. The examination for the inclusion bodies may be regarded as an additional factor of importance for making the diagnosis of scarlet fever, but it must be remembered that, at the present time, there is no one sure method of making the diagnosis, so that all possible clinical symptoms and signs must be considered before arriving at a conclusion.

**SCARLET FEVER DESQUAMATION AND CONTAGION.** There are a great many changes going on in our opinions concerning the transmissibility of infectious diseases. In former days it was taught that scarlet fever was transmitted by the scales of skin, but of recent years this has been doubted very much. It would seem that the disease is transmitted by the nasal and mouth secretions, from the discharge from abscesses or ears, and it would seem that the disease is very largely transmitted by direct contact, and that fomites play a comparatively small role, and probably only when the object has been actually soiled by nasal, buccal, or aural secretions. There is, at present, no way of telling how soon the scarlet fever virus dies after it leaves the human body, but I think it is safe to say that it does not live long, and the cases of transmission of the disease by means of letters and the like are probably all more or less erroneous. It would seem to be quite probable that scarlet fever carriers exist in exactly the same way as diphtheria carriers do, and that many of the cases that are blamed on fomites can be explained in this manner.

I remember one instance in which a mother was nursing a child with scarlet fever. She returned to her home in another State without the child. Everything that the woman owned was disinfected, except the shoes that she wore. Shortly after her return home, one of her children was infected and the shoes were blamed. It seems very much more probable that the woman carried the disease in her nose and throat, or that possibly the child was infected in some other manner. The English authorities, in some hospitals, have for years, been disregarding desquamation. In 204 cases discharged from the hospital in which there was peeling without complication, only two gave return cases.

Chapin is of the opinion that most of the disease in other families develops within a few days of the primary cases, and is due to contact infection before the disease is recognized. Between the end of the second week and the termination of the isolation, the disease spreads to other families in only 0.6 of the cases, and, in very many of the households, it was known that isolation was not carried out. The scales of skin can be regarded very much like any other fomites, and, if the child has been isolated for four weeks and has no complication, I believe that it may be released from quarantine without any very great amount of danger, if any, for other people, and I have no doubt that in the future some definite means of determining how long the contagion lasts in any individual will be found.

Meade<sup>1</sup> cites two instances in which children returned to school in the acute stage of primary desquamation. In one case, the child had been at school for five days in this stage, and mingled freely with the other children. In neither case was there any second cases of the disease. I am of the opinion that if we devoted more time to strict isolation of scarlet fever at the beginning of the disease, and more careful control of suspects, the results would be better than by paying a great deal of attention to the late weeks of the disease.

THE TRANSMISSION OF SCARLET FEVER TO THE LOWER MONKEYS. A number of observations have been made upon this subject, the first one being that the Grünbaum who, in 1904, produced symptoms in a chimpanzee which he clad in a night shirt of a scarlet fever patient. The animal's throat was also rubbed with secretions from the pharynx of a case with scarlet fever. The symptoms were somewhat doubtful, but suggested scarlet fever. Hektoen and Weaver, in 1911, fed *Macacus rhesus* monkeys on milk which was contaminated with swabbings from the throats of scarlet fever patients. These experiments were negative. Cantacuzéne, in 1911, announced that he had produced scarlet fever in the various lower monkeys by inoculating them with blood, pericardial effusion, and emulsions made from the lymph node from cases of scarlet fever. Benhardt, in the same year, reported that he had produced the disease in the *Macacus rhesus* by subcutaneous inoculation of scrapings from the tongue and other material from scarlet fever patients, and also from merely swabbing the throat with the scrapings from the tongue. He also stated that he had produced the disease by using an emulsion from the lymph nodes from a case of scarlet fever which had been passed through a Berkefeld filter. These observations were followed by those of Landsteiner, Levaditi, and Prasek.

All of these observations were commented upon last year in *PROGRESSIVE MEDICINE*, and are referred to here in connection with an

<sup>1</sup> Medical Record, February 15, 1913, p. 293.

article by Draper and Hanford<sup>1</sup> who made a critical study of this subject. They raised the point that the diagnosis of scarlet fever in the monkeys used for the experiments, rests on a rather unstable basis of variable symptoms and signs, and, inasmuch as the cause of scarlet fever has not been definitely settled, it is impossible to use criteria which are available in judging experimental results in other diseases. They carried on a series of experiments with material from scarlet fever patients, some artificially sterile, some fresh and unsterile, and some fresh and sterile. Fresh, unsterile material consisted of sputum, scrapings from the tongue and throat, swabs from the nose and pharynx, finely chopped tonsils, washings from extirpated tonsils, and discharge from the ear. The third class, or sterile material, consisted of urine which was found sterile by culture, blood from the veins, defibrinated blood, sputum filtrates, filtrates of broth cultures of the streptococcus from scarlatina sore throats, and blood from the scarlet fever patients mixed with ascitic broth and incubated at 37° C.

Without going into the details of their experiments, it may be stated that these materials were injected subcutaneously, and intraperitoneally without serious effect, and, as a result of their experiments, the author believes that the report of the transfer of scarlet fever to both higher and lower monkeys is not definitely established. They assume that in their experiments, the infectious agent was carried over to the monkeys, but that the failure to cause infection depended either upon the susceptibility of the monkeys employed, or to the mode of introducing the agent. From their observations, they believe that the temperature curve and leukocyte count in monkeys are unsatisfactory criteria for the diagnosis of disease in these animals, and that they frequently have transient blotchy, erythematous eruptions on the face and back, and always have bran-like desquamation. Future experiments on the subject of the transmissibility of scarlet fever will be watched for with great interest.

**THE TREATMENT OF SCARLET FEVER WITH NEOSALVARSAN.** Certain cases of scarlet fever have given a positive Wassermann reaction, and, for this reason, salvarsan has been tried in scarlet fever, including numerous observations by Lenzmann, Schreiber, Klemperer and Woita. Lenzmann gave infants 1.1 gram, and older children 1.2 or 1.3 gram of salvarsan by intravenous injection. Some of the children were given as many as 3 or 4 injections. A decided antipyretic effect was noted, and Schreiber observed the rapid disappearance of the necrosed tissues after the use of injections of neosalvarsan. Klemperer and Woita have reported 39 cases treated with salvarsan, and noted the same effects as the other observers.

Neosalvarsan has been preferred by some observers, as it is soluble

<sup>1</sup> Journal of Experimental Medicine, 1913, vol. xvii, p. 517.



in water and more easily prepared than salvarsan. For intravenous injections, Fischer advises 20 c.c. of freshly distilled water to each 0.1 gram of neosalvarsan, or in the average dose 0.9 gram is dissolved in 180 c.c. of distilled water, as 0.6 gram of salvarsan is the equivalent of 0.9 of neosalvarsan. Fischer<sup>1</sup> used the injections in 5 cases of scarlet fever. Owing to the small size of veins in infants and in children, the median basilic vein was chosen, and it was found necessary to expose it in order to be sure that the injection was properly given. The injection was not followed by any acute febrile attack nor by shock or rash. Five cases, in which the drug was used, were all of the severest septic type in which death seemed to be imminent. Marked gangrenous or suppurative lesions were present in all cases, and, in one, there was an extensive noma. Four of the cases died, but one, in which there was a gangrene of the right foot probably due to the thrombus, recovered and in this case the child recovered sufficiently after the administration of the drug, to permit of an amputation of the foot, and eventually made a good recovery. Fischer believes that, in the cases of septic scarlet fever in which the outlook seems to be fatal, neosalvarsan should be administered, although he realizes that the small number of cases in which it has been used up to the present is not sufficient on which to base any definite conclusions.

**Smallpox.** THE VARIATION IN TYPE OF INFECTIOUS DISEASES AS SHOWN BY THE HISTORY OF SMALLPOX IN THE UNITED STATES. Chapin<sup>2</sup> has made a study of smallpox largely based on the epidemiological data obtained from the Public Health Service. Until 1897, the usual severe type of smallpox had prevailed throughout the United States, but, in that year, with the exception of a very few cases, the severe form of the disease nearly disappeared. In 1896, a very mild type of smallpox began to prevail in the south, and later gradually spread over the country. As very few deaths occurred; it was first mistaken for chickenpox, or by some supposed to be a new disease, variously known as Cuban itch and a great many other different varieties of itch, and it excited considerable attention. Most of the cases were in negroes who paid little attention to the disease, and, as employees of railroads and steamboats, they carried it from place to place. In 1897, it spread into West Virginia, Pennsylvania, and, in the following year, it spread west and north. In 1899, it had extended into New England and nearly all of the Pacific and Rocky Mountain States. In 1900, both in the eastern and western part of Canada, the same mild smallpox was noted. The disease was also carried to the Barbadoes.

It was also reported in Brazil and various islands in the Atlantic. This mild type was probably also carried into England in 1902, and, wherever it occurred, it was the object of considerable interest and

<sup>1</sup> Archives of Pediatrics, May, 1913, p. 352.

<sup>2</sup> Journal of Infectious Diseases, September, 1913, p. 171.

controversy, inasmuch as smallpox is usually considered to be a serious disease, and the general practitioner could not associate his ideas with this type which was so prevalent.

At the same time that this atypical smallpox was present, the normal or more severe type of the disease was noted from time to time, and, in many instances, it was apparently derived from foreign sources. It would seem that, for some reason quite unknown, the type of smallpox has changed, and that there occurred in 1896, in Florida, a focus of this disease from which the other mild smallpox seems to have sprung. It is quite probable that some of the severer smallpox may have been derived from the mild cases, as the degree of virulence in the various infectious diseases always varies somewhat, but the evidence seems to point to the fact that during the past fifteen years there have been two quite distinct strains of smallpox. As far as can be determined, both of these strains have a tendency to breed true mild cases coming from the mild forms and the ordinary or severe smallpox from the severer type. Wherever the cases could be traced to foreign sources, the disease was of the normal or severe type. Anyone interested in the subject of the epidemiology of smallpox will do well to read the details of Chapin's investigations on this point.

THE BLOOD IN SMALLPOX AND VACCINATION. The examination of blood in doubtful cases of smallpox is supposed to be of considerable value, but the blood picture is so little known that it may be well to call attention to some of the observations which have been made upon this subject.

As early as 1874, Brouardel noted the increase in leukocytes, but no differential counts were made. In 1900, Courmont and Montagard studied 29 cases in an epidemic that occurred at Lyon, and, more recently, Kammerer<sup>1</sup> made an extensive study of this subject. The observations of these authors are in accord with the changes that may briefly be described as follows: There is a more or less constant leukocytosis from the normal count up to 30,000, and this seems to vary directly with the severity of the constitutional symptoms. There is a relative decrease in the neutrophiles, generally between 30 and 50 per cent., but the absolute number of the cells is about normal. The eosinophiles and mast cells are about normal, and the eosinophiles never disappear, but, if anything, are slightly increased. There is a relative and absolute increase of the mononuclears, which make up 40 per cent. or more of the cells. There is some difference of opinion as regards some of these mononuclears, as to whether they are lymphocytes or not, and they probably are, so that this being the case the mononuclears and transition forms are about normal or somewhat increased. There is a certain number, sometimes as many as 5 per cent. of irritation forms.

<sup>1</sup> Deutsch. Archiv für klinische Medizin, 1910, Bd. 99, p. 354.

Erlenmeyer<sup>1</sup> has made a study of a number of smallpox cases, and believes that the mononuclears referred to are lymphocytes, and he also made a study of the blood in a vaccination and did not find any changes whatever in the number of leukocytes. He is of the opinion that a careful examination of the blood in doubtful cases will be of great value in settling the diagnosis.

**BONE LESIONS IN SMALLPOX.** This subject has been studied by Musgrave, Sisson, and Crowell.<sup>2</sup> They found, in individuals who had had smallpox in early life, that is, before the complete ossification of the bones, that there were certain changes that took place, particularly in the long bone and their articulations. The bones of the arms are more frequently affected than those of other parts of the body, the radius and ulna being more frequently involved than the humerus, and the bones of the hand, and an analogous involvement is true of the bones of the leg. The chief change is that the diaphyses of the bones are shorter than normal, and that there is considerable deformity of the ends of the bones. The microscopic examination of the bones, that could be secured at autopsy, showed nothing, and the authors are inclined to believe that these changes were the results of smallpox which occurred during early age.

**THE RELATIONSHIP OF SMALLPOX AND VACCINIA.** There has always been a great deal of discussion on this subject and a great many different ideas have been advanced from time to time. One of particular interest has recently been put forth by Ashburn.<sup>3</sup> The smallpox contagion or inoculation gives rise to the disease which is highly contagious and extremely characteristic in man. If, however, the virus is passed through monkeys or cattle for a few generations, and brought back to man, the virus gives rise to vaccinia, which is a localized, non-contagious disease. When the virus has once lost its power to produce smallpox, it never regains it, even though passed from person to person for a long period of time.

Only two theories can explain the facts in the case. The first is that the germ of smallpox, in passing through certain of the lower animals, becomes altered and transmits this change in characteristics to its offspring forever, which, if true, is a most remarkable instance of the hereditary transmissions of acquired characteristics. The second explanation, and the one which Ashburn has considered, is, that smallpox is due to a dual and a divisible virus, one part of which causes vaccinia and the specific smallpox eruption, and the second which is necessary for the production of the contagious, generalized, mortal disease with a distinct præruptive stage and initial rashes.

The facts which Ashburn brings out in special favor of this is the

<sup>1</sup> Deutsch. medizinische Wochenschrift, January 2, 1913, p. 21.

<sup>2</sup> Philippine Journal of Medical Sciences, April, 1913, p. 67.

<sup>3</sup> Journal of the American Medical Association, April 19, 1913, p. 1220.



more or less analogous, close association of two viruses, as in hog cholera and in dog distemper, where a filterable virus and bacillus act together. It is also suggested that hydrophobia might come under the same head, the street virus corresponding to smallpox and the fixed virus to vaccinia, and a simple explanation would be by assuming the duality of the virus. The second point is the behavior of the various animal poxes, that is, that smallpox, cowpox, horsepox, and sheeppox mutually protect one against the other, while they have clinical differences. Another point is the fact that it is very difficult and often impossible to carry smallpox direct from man to the calf, but, once established in the calf, the pox virus becomes strengthened to such a degree that it protects against later vaccination better than does an attack of smallpox, so the latter, by causing immunity to both parts of the smallpox, affords better protection against that disease. The part of the smallpox virus which is not concerned in the pock formation, but which is necessary for the development of the contagious disease, disappears after a few bovine passages, and is therefore unable to participate in the immunization resulting from vaccination. Certain other clinical explanations may be brought forward in the support of this view of the dual character and virus.

**THE VIRUS OF SMALLPOX.** It has long been known that the virus of smallpox, and also of vaccinia, can be preserved in glycerin for long periods of time. Almost all bacteria are sooner or later destroyed by the glycerin, and in a comparatively short time more or less pure virus may be obtained. If the virus is kept cold, well under the freezing point, even the glycerinated virus will remain active for years, but, at a body temperature, the virus is gradually weakened.

Fornet,<sup>1</sup> in searching for other means of producing sterile vaccine virus, found that etherized virus remains sterile and active for weeks after the inoculation on various culture mediums. This virus could be used for the inoculation of human beings and also of rabbits and calves, and produces typical vaccination vesicles. In addition to this, the virus has been carried through a series of inoculations upon broth, beef serum, and agar, apparently without any loss of virulence, and it seems that, if this is true, the virus must have grown on the culture media. If there had not been any growth, Fornet calculates that the dilution of the sterilized virus would have reached 1 to 1000 billion. The cultures were examined with the ultramicroscope, and showed the presence of minute bodies, somewhat resembling diplococci, of unequal size and surrounded by a clear zone.

Experiments made in a similar manner with material obtained from a smallpox pustule behaved in a like manner, and also contained the same small bodies. This is a piece of work which is very suggestive,

<sup>1</sup> *Deutsche medizinische Wochenschrift*, 1913, vol. xxxix, p. 1813.

and, if it can be substantiated, will open up a new way of studying certain of the viruses, particularly those which more or less resemble that of smallpox, and it may lead to better results in growing such virus and also to the production of purer vaccines. Ether has been used for preserving rabies virus, although this has never come into general use.

**THE TREATMENT OF SMALLPOX.** Since tincture of iodine was suggested in the treatment of smallpox quite a number of reports have been made showing the value of this method of treatment. Apparently to obtain the best results, the iodine must be applied early, and the parts should be covered with dressings. Even if it is not started until the later stages, the use of iodine has been attended with remarkably good results, and apparently with very much less scarring than would ordinarily take place. This method of treatment might be followed in other skin lesions in which there is suppuration. Care should be taken to use freshly prepared tincture, as after the solution of iodine has stood for some time it is apt to develop irritating qualities.

**Rocky Mountain Spotted Fever.** This fever, which is transmitted by the bite of the wood tick *Dermacentor andersoni*, has been a matter of considerable interest, as noted in previous issues of *PROGRESSIVE MEDICINE*. This disease is found in Idaho and Wyoming, and, for some unknown reason, one valley of the west side of the Bitter Root River harbors a particularly virulent strain of spotted fever. Five different methods of eradicating the ticks have been suggested:

1. Clearing and cultivation of tillable land.
2. Burning over of foothills.
3. Killing of the small wild animals.
4. Dipping of domestic animals in arsenical dip.
5. Spraying and removing ticks by hand from the domestic animals.

Fricks<sup>1</sup> has reviewed the work which has been done in the infected area, particularly on the west side of the Bitter Root Valley, and although all five of these measures have been employed, there has been little diminution in the number of ticks and the number of deaths from spotted fever. Certain areas have been rendered free from ticks by cultivation, but much of the country is incapable of being converted into tillable land. In 1911, Hunter and Bishopp<sup>2</sup> claimed that by the dipping and hand treating alone of domestic animals, the ticks could be eradicated from the valley within three years. In the following year, McClintic<sup>3</sup> pointed out the undue optimism of the statement, and subsequent observations seemed to confirm his opinion.

Sheep raising has been a considerable industry on the east side of the Bitter Root Valley since 1890, and it is commonly reported that the entire east side of the valley twenty-five years ago, before sheep

<sup>1</sup> Public Health Reports, August 8, 1913, p. 1647.

<sup>2</sup> Bulletin No. 105, U. S. Department of Agriculture, 1911.

<sup>3</sup> Public Health Reports, May 17, 1912.

raising was started, was just as full of ticks as the west side is at present, and an examination of the country over which the sheep have been continuously grazing, proved that this in itself seems to free the country from these insects. For purposes of experimentation, a band of 61 sheep was obtained, and ticks were placed in the wool of the unshorn animals. Of these, over 87 per cent. were recovered dead. They also found that the majority of the ticks recovered from sheep grazing over the tick-infested territory were found dead, and many of the engorged animals that recovered appeared to have not been fertilized. Comparatively few ticks, either dead or alive, were found on the sheep after they had been shorn. It has been suggested that a large number of sheep be used for grazing purposes over the infected area, and that this should be accompanied with the destruction or removal of other large mammals, both domestic and wild. The close grazing of the sheep causes destruction of the undergrowth which in itself prevents the development of the ticks, and those which remain in all probability would be destroyed by the grazing sheep. The use of sheep would mean placing the problem of tick eradication on an industrial basis, and Fricks believes that if this is done Rocky Mountain Spotted Fever may eventually be eradicated from the territory which it now occupies.

**The Dwarf Tapeworm.** The *hymenolepis nana* has recently been found in France by Garrin and Chancel<sup>1</sup> for the first time. This parasite has been observed nearly everywhere in America, Europe, and Asia. It was first described by Bilharz in 1851, and it was subsequently studied by von Siebold in 1852, Leuckhart in 1863, and by a number of others since that time. As its name indicates, the organism is very short, varying between 12 and 15 mm. in length and from 0.5 to 0.8 in diameter. It has from one to two hundred rings, the head is round, somewhat flattened, and provided with four suckers which are armed with hooklets. The organism has been found a great many times in America. (See Intestinal Parasites in Children.) In Germany, it has been observed a few times in spite of the fact that in many hospitals a large number of examinations of the stools are made. Scattered cases have been described in England, Russia, Servia, Austria. It is quite common in Italy, and it is said that 10 per cent. of the children in Sicily are affected with this parasite. It has also been described in Egypt, Siam, and Japan, in the Philippines, in Brazil, and in Argentina.

The symptoms produced by this parasite are an irritation of the mucous membrane of the intestine, which is generally manifested as a diarrhea, with rather frequent stools containing considerable mucus and sometimes blood. There is a certain amount of digestive disturbance, and usually some anemia. Curiously enough, symptoms relating

<sup>1</sup> Gazette des Hôpitaux, No. 76, July 5, 1913, p. 1237.



to the eyes appear to have been noted; dilatation of pupils, blepharospasm, strabismus, and sometimes frontal headache and nervous symptoms, such as convulsions hysterical or epileptic in type. These symptoms disappear when the parasite is got rid of. There is a slight degree of eosinophilia, which is not usually sufficiently marked to attract attention. The examination of the stools usually shows a large number of eggs which have three pairs of hooklets on the embryo, a point common to the eggs of all cestodes. The dwarf tapeworm is further distinguished by having two distinct membranes. The rings or segments of the parasite are rarely, if ever, found prior to treatment. The reaction for occult blood, which is easily made, is of considerable value, as the parasite is almost invariably accompanied with a certain amount of blood in the stools. The best method of treatment is by the use of the male fern, the other vermifuges do not seem to be as effective; with any method of treatment, the parasite is apt to be extremely resistant. The article which has been referred to has an extremely complete bibliography which will be of use to anyone working upon this subject.

**Fourth of July Tetanus in 1913.** The *Journal of the American Medical Association*, August 30, 1913, p. 679, has summarized the results of the investigation concerning the prevalence of tetanus as the result of Fourth of July injuries. In 1903, ten years ago, there were 417 cases of tetanus. This number has gradually reduced to 76 in 1908 to a rise of 150, and since then there has been a steady reduction until last year only 4 cases were reported, one from Indiana, one from Kansas, and two from New York; and all four were the result of injury from blank cartridges. It is interesting to note the causes of death not due to tetanus which are due to injuries resulting from fire works. There were 29 in all last year. The only way to avoid these deaths is the education of the people to other forms of celebration than that of fireworks, and, from the figures given by the journal, it would seem that a very satisfactory progress has been made in this direction.

**BACCELLI METHOD OF TREATING TETANUS.** The July number<sup>1</sup> of *Il Policlinico* contains a series of reviews and articles on the subject of Baccelli's method of treating tetanus. Cases are reported by Lepore, Righi, Piccaluga, and others, and the results are so satisfactory that, although I have noted this method of treatment before, I feel that, in the present state of our knowledge of the therapeutics of the disease, it should be emphasized, as it offers greater hopes of cure than any other method.

As described by Baccelli himself, injections are given every four hours, and consists of 2 c.c. of a 3 per cent. solution of phenol (carbolic acid), so that one introduces into the body 0.36 gram of pure phenol

<sup>1</sup> *Il Policlinico*, Sezione Practica, July 6, 1913, p. 933.

in twenty-four hours. This amount may be increased to 0.48 gram, or, in some cases, even more has been given. The effect of the drug is noted early, and after two or three days the results are usually quite marked. As a rule, the drug is very well borne and the urine remains normal. The urine should be carefully watched and in case it becomes very dark in color and contains blood the drug should be withdrawn. Ordinarily, the mortality from tetanus is about 90 per cent., but these figures differ greatly at different times and in different parts of the world. In Baccelli's series of cases, the mortality was 17.6 per cent.; according to some observers, in a similar collection of cases, the mortality has been as low as 10 per cent. It seems possible that this method of treatment might be applied to advantage in some of the other bacterial diseases in which the results are at present very unsatisfactory.

**Parasitic Thyroiditis.** There has been considerable work done by the physicians of South America, most of which does not find its way into the literature either in Europe or of North America, but among the contributions which have been noted is that of a form of parasitic thyroiditis known under the name of the disease of Carlo Chagas. This disease is due to a trypanosome, *Trypanosoma cruzi*, which is inoculated into man by a species of large insect, the *Conhorinus megistus*, ordinarily spoken of in South America as *barabeiro*. This insect bites only at night.

The clinical symptoms produced are generally those which are associated with a lessened thyroid secretion, but five forms of the disease have been described: a pseudo-myxedematous, the myxedematous, the cardiac, the nervous, and a chronic form with acute exacerbations. In some instances, the disease suggests an acute meningoencephalitis, in which the parasite is chiefly localized in the central nervous system. This gives rise to marked symptoms of diplegia, usually of a spastic type, with disturbance of the intellect and of speech, a clinical picture varying greatly according to the part of the brain involved. Sometimes the disease resembles a hemiplegia; sometimes there are convulsions and fever, and the clinical picture suggests meningitis. Later, the patient suggests a cretin, and is usually reduced to a condition of idiocy. The disease is, according to Chagas and Vianna, entirely distinct from endemic cretinism. The work of these two authors has been reviewed by Tremonti.<sup>1</sup>

**Trachoma.** Schereschewsky<sup>2</sup> has studied the prevalence of trachoma among the Indians and found that 22.7 per cent. of the entire number examined had trachoma, which means that, if the same rate of infection is found to prevail over the entire Indian population of the United

<sup>1</sup> Il Policlinico, Sezione Practica, May 18, 1913, p. 697.

<sup>2</sup> Journal of the American Medical Association, September 27, 1913, part 2, p. 1113.

States, that there are some 72,000 cases of the disease among this class of the population.

The accompanying table shows the number of Indians examined in each state, the number of cases of trachoma found, and the percentage of incidence.

TABLE SHOWING PREVALENCE OF TRACHOMA AMONG INDIANS IN DIFFERENT PARTS OF THE COUNTRY

State.	Indians examined No.	Cases of Trachoma	Per cent.
Arizona . . . . .	5,873	1459	24.9
California . . . . .	1,555	238	15.3
Colorado . . . . .	292	41	15.64
Florida . . . . .	22		
Idaho . . . . .	526	84	16.96
Iowa . . . . .	53	17	32.04
Kansas . . . . .	834	176	21.1
Michigan . . . . .	643	48	7.46
Minnesota . . . . .	3,542	533	15.05
Montana . . . . .	2,042	537	26.3
Nebraska . . . . .	322	130	41.
Nevada . . . . .	851	229	26.9
New Mexico . . . . .	2,207	494	22.38
New York . . . . .	943	2	0.2
North Carolina . . . . .	317	23	7.
North Dakota . . . . .	3,447	791	22.94
Oklahoma . . . . .	3,252	2235	68.72
Oregon . . . . .	904	94	10.4
Pennsylvania . . . . .	552	76	13.76
South Dakota . . . . .	6,121	1059	17.24
Utah . . . . .	182	75	39.
Virginia . . . . .	43	13	30.2
Washington . . . . .	1,347	180	13.85
Wisconsin . . . . .	2,999	207	6.86
Wyoming . . . . .	392	199	51.
	39,231	8940	22.7

TRACHOMA IN KENTUCKY. There are certain areas in the United States in which trachoma seems to have found a foothold and from which it is extremely important that it be eradicated. The importance of trachoma as the cause of blindness is usually underestimated. In the Kentucky Institution for the Blind, it is stated that 45 per cent. of the inmates were blind from trachoma, and 26.3 per cent. from ophthalmia in the newborn.

McMullan, of the United States Public Health Service, has made a preliminary survey of the situation in the eastern part of Kentucky. In seven counties in which the disease was looked for, it was found, and in rather large numbers of cases. How long the disease has been



in Kentucky nobody knows, but sore eyes have been prevalent beyond the recollection of the oldest inhabitants. There is a very great field now for preventive measures so as to limit the spread of the disease, and also for the treatment of the cases that already exist. Stuckey, Medical Director of the Woman's Christian Temperance Union Settlement School at Hindman, Knott County, Kentucky, has started a certain amount of work in treating trachoma cases, but the disease covers such a large territory that it will require a systematic and persistent effort to eradicate it.

It would seem to me that the function of the United States Public Health Service ought to locate the various preventable diseases, and to take charge of the work of eradicating them in connection with the local health government. Outsiders will have a very much greater influence and do very much better than can possibly be expected of overworked, underpaid health officers who must practise medicine in connection with their health work in order to gain a livelihood. This offers another example of illustrating the great necessity of trained health officers who do nothing but look after the public health work.

Clarke,<sup>2</sup> in coöperation with the Director of the State Board of Health of Minnesota, has made a study of the disease as it occurs in that State, and they found 31.4 per cent. of trachoma in the whole population at the White Earth reservation, and they believe that a more detailed study would have shown 50 per cent. or more in the same district. They found that the Indian population is a threatening focus of trachoma infection, and even though the disease is not spread from them to the white population to any great extent, they believe that it is highly important to take steps to prevent its further spread. Trachoma has also been found in some of the mining districts, and there is no doubt that a careful study of the population of the various states with reference to trachoma will be a most valuable undertaking from the standpoint of public health.

**Typhoid Fever.** TYPHOID IN THE LARGE CITIES OF THE UNITED STATES. It is very interesting to compare the typhoid rates in the various cities as found in the following tables from a review in the *Journal of the American Medical Association*, May 31, 1913, p. 1702. The most striking thing is the reduction of typhoid, as it occurred in Philadelphia and Pittsburgh, following the installation of sand filters for their water supply. The diminution noted in Baltimore is probably due to the use of hypochlorite in treating the water; in the second group of cities the same thing will be noted in regard to Cincinnati, while the increase in Milwaukee would suggest great carelessness in regard to the water supply, a point which has been brought out in studies made with the typhoid situation in that city. Only two tables are given. The other three have essentially

<sup>1</sup> *Journal-Lancet*, March 15, 1913, p. 159, and *Public Health Reports*, June 27, 1913.

the same relation, and that is that a certain rather large proportion of typhoid fever in the American cities can be done away with by providing pure drinking water. As long as this is not done, the citizens have only themselves to blame for the unnecessarily large number of cases and deaths. In fact, the apathy in regard to death and disease from preventable causes is one of the most remarkable features of our American life.

TABLE I.—DEATH-RATES FROM TYPHOID IN CITIES OF GROUP 1 (POPULATION OVER 500,000)<sup>1</sup>

	Deaths from typhoid per 100,000 population.		Average. 1906-1910
	1912	1911	
Cleveland . . . . .	5.9	14.7	16.5 (5)
Chicago . . . . .	7.5	10.8	15.5 (2)
Boston . . . . .	8.1	9.3	16.0 (3)
New York . . . . .	9.8	11.1	13.8 (1)
St. Louis . . . . .	10.4	15.4	16.1 (4)
Philadelphia . . . . .	12.5	14.1	42.1 (7)
Pittsburgh . . . . .	12.7	25.8	74.3 (8)
Baltimore . . . . .	23.9	27.2	34.6 (6)

TABLE II.—DEATH-RATES FROM TYPHOID IN CITIES OF GROUP 2 (POPULATION FROM 300,000 TO 500,000)

	Deaths from typhoid per 100,000 population.		Average 1906-1910
	1912	1911	
Newark, N. J. . . . .	7.1	10.3	14.6 ( 1)
Cincinnati . . . . .	7.5	11.7	30.0 ( 7)
Buffalo, N. Y. . . . .	11.4	25.1	22.8 ( 3)
Minneapolis . . . . .	11.5	11.6	32.2 ( 8)
New Orleans . . . . .	14.0	30.7	35.6 ( 9)
San Francisco . . . . .	14.1	15.6	27.3 ( 6)
Los Angeles . . . . .	14.6	12.6	19.0 ( 2)
Detroit . . . . .	17.1	15.6	23.4 ( 4)
Washington, D. C. . . . .	21.2	20.9	36.9 (10)
Milwaukee, Wis. . . . .	25.3	19.3	27.0 ( 5)

ANTITYPHOID VACCINATION BY THE METHOD OF METCHNIKOFF AND BESREDKA. The method of using sensitized typhoid bacilli for purposes of vaccination has not received very great consideration outside of the work of the Pasteur Institute and those in more or less direct relation with it. Metchnikoff and Besredka<sup>2</sup> have given a resumé of their later experiments on animals, and they have been able to confer an immunity on chimpanzees which is apparently almost perfect, and these animals were able to withstand doses of typhoid bacilli which were capable of producing the disease in the control animal. They also

<sup>1</sup> The figures in parentheses in the last column give the relative standings in death-rate, 1906-1910, of the cities in the group.

<sup>2</sup> Annales de l'Institut Pasteur, August, 1913, vol. xxvii, p. 597.

determined the fact that the sensitized vaccines, when introduced under the skin, even in very large doses, were destroyed at the site of injection and that they did not pass into the blood, into the urine, nor into the stools, so that the subjects vaccinated were in no danger of becoming typhoid carriers.

In 1911, Besredka<sup>1</sup> began to use this method in man, and, after considerable experience with it, he was of the opinion that when injected subcutaneously or into the muscles it is entirely harmless, even in large doses, and studies made upon the blood, urine, and stools corresponded to those of animals, that is, that there is no danger of individuals so injected, becoming typhoid carriers. They believe that this vaccine may be used under all conditions, and, so far as they have been able to determine, has no contraindications. In other words, it can be used in individuals who are not in perfectly good health without producing any untoward reactions. Their original doses were five hundred million bacilli. Since that time they found that larger doses may be used without danger, and they speak of using 2 c.c. and more, but, as is the case with so many French articles, the strength of the emulsion used is apparently not stated, but this probably appears in some previous contribution.

**ANTITYPHOID VACCINATION IN CHILDREN.** There have been very few reports made on this subject, and, inasmuch as typhoid fever is a disease of early life, it would seem extremely desirable to have all children who are liable to contract the disease given the vaccination, especially as there are apparently no harmful effects from its use in children.

Russell<sup>2</sup> had collected 359 instances, between the ages of two and sixteen years, who have been vaccinated by 50 different physicians in various parts of the United States. Out of the entire 359, there was only one severe reaction reported and only six others that were sufficiently marked to be noted. The severe reaction occurred after the first injection, and there were no severe reactions after the second or third. The dosage should be based upon the body weight, the amount given to be the proportional part of the adult dose determined by the child's weight as compared with the average adult weight, which may be taken as 150 pounds. The nearest easily-managed fraction is chosen. The inoculation should be made in the afternoon at four o'clock, or later, so that any reaction which comes will be after bedtime. Russell believes that revaccination should take place earlier than in adults, and that, after three years, two or three additional doses should be given.

**TYPHOID CARRIERS TREATED WITH VACCINES.** Various reports have been made concerning the use of vaccines in treating typhoid

<sup>1</sup> *Annales de l'Institut Pasteur*, August, 1913, vol. xxvii, p. 607.

<sup>2</sup> *Journal of the American Medical Association*, February 1, 1913.



carriers, one of particular interest being that of Bavies and Hall.<sup>1</sup> They made a very thorough study of a female, aged thirty-three, who had typhoid in July, 1905. Since that date, 8 cases of infection have been traced to her, and she came under observation in January, 1909, and proved to be a urinary carrier. For a period of three months urotropin was given. Under this treatment the excretion of typhoid bacilli in the urine was decreased, but not stopped altogether. In April, 1909, an emulsion of typhoid bacilli prepared from the patient's own organism was given, and doses were continued until one thousand million were reached. The injections were discontinued at the end of December, 1909, and the patient was kept under observation from October, 1909, until January, 1910. No typhoid bacilli were excreted in the urine. They reappeared on January 4, 1910, and persisted until February 27. Potassium citrate was given for three weeks, after which there was a cessation of excretion of bacteria until the following July.

In November, 1910, the patient was found to be in good general condition and her temperature was normal. A cystoscopic examination of the bladder was made, and it was found to be normal, except at the right ureteric orifice where there was marked edema and some superficial ulceration. A catheter could not be introduced more than  $6\frac{1}{2}$  inches, when it reached an impassable obstruction. The urine obtained from the right ureter contained much pus, and yielded a pure growth of typhoid bacilli. The left ureter was catheterized with ease, and the urine was free from pus and typhoid bacilli. An x-ray was taken and showed a shadow in the right kidney, and an exploration revealed what was apparently a normal kidney, but, when bisected longitudinally during a search for foci of suppuration ten small calculi were found lying in one mass near the pelvis. These were removed and the cavity scraped; the kidney was sutured and returned into the body.

Cultures taken from the pelvis of the kidney yielded a pure growth of typhoid bacilli and they were also isolated from the calculi. Following the operation there was some fever, which gradually fell until it reached normal. About ten days after the operation the typhoid bacilli disappeared from the urine, but, subsequently, pus and bacilli then reappeared and persisted for the next eight months. On March 4, 1911, it was decided to give the patient 1 gram of borovertin daily, and this continued until May 24, when it was stopped because the patient complained of being run down. During the administration of this drug, the patient lost 7 pounds in weight. After the drug was discontinued, she rapidly regained this lost weight, and her condition soon was as usual. On July 31, the borovertin was again given in the same doses until September 2. The weight again fell 5 pounds.

During both periods of the administration of the drug the excretion

<sup>1</sup> The Lancet, November 8, 1913, p. 1306.

of pus and bacilli was unaltered. On July 1, 1911, the blood yielded a typhoid organism which was agglutinated by the patient's own blood in 1 to 500, and, after three weeks' cultivation, in 1 to 800; cultures of this organism and of a subculture from the urine were repeatedly subcultured for three weeks on serum agar, blood agar prepared from the patient's own blood, and carbolic acid agar. At the end of three weeks, a bacterial emulsion was prepared from the mixture of the growths from the several media and injected. The pus and typhoid bacilli disappeared from the urine while the agglutination of the blood rose from 1 to 500 and a systematic examination since then to January 23, 1913, failed to reveal any further excretions of the organisms, while the agglutination titer had fallen from 1 to 150. The history of this case with the painstaking following up of all the facts pertaining to it shows what results may be obtained by persistence. When it is possible that the typhoid latency has not entirely disappeared, it seems highly probable that this carrier has finally yielded to treatment by a specially prepared vaccine.

**THE SURGICAL TREATMENT OF CHRONIC TYPHOID CARRIERS.** The chronic typhoid carrier is a menace to the community and a very difficult individual to deal with, so that any suggestion which gives hope of either solving the problem, or partly solving it, is of great interest.

Leary<sup>1</sup> has operated on two patients, removing the gall-bladder and cystic duct. He believes that this method may be of great service, and urges its further trial in cases which resist other methods of treatment. He believes, however, that the different medical treatments, especially the continued use of typhoid vaccines, should be thoroughly tried before recommending surgical interference. The exact value of this method of treatment, whether it will eventually be deemed advisable or not, can only be cleared up by a larger series of cases.

**THE VALUE OF TYPHOID VACCINATION IN CIVIL COMMUNITIES.** The value of typhoid vaccination in armies has been so thoroughly demonstrated that it is scarcely necessary to add anything to this subject. The same is true of the personnel of hospitals, but Ebersole<sup>2</sup> has collected a few statistics which are not without interest. In 23 hospitals, in a period of three years, in Massachusetts, 1361 persons were vaccinated. All of those were exposed to typhoid contagion and only 2 cases of typhoid occurred. As a contrast, 674 persons under the same conditions, but who were not vaccinated, had 8 cases of typhoid. In Baltimore, 184 physicians, nurses, and laboratory workers, and 887 inmates and employees in a hospital whose morbidity in the previous year had been 1 per cent. were vaccinated, and not a single case of typhoid was reported; while in 333 persons under the same conditions, 3 cases of typhoid were reported.

<sup>1</sup> Journal of the American Medical Association, April 26, 1913.

<sup>2</sup> Medical Record, November 15, 1913, p. 894.

In a small typhoid epidemic in Connecticut, eighty nurses were employed, of whom 45 were vaccinated, and not a single case of typhoid occurred among them; but there were 5 cases among the 35 who refused to be vaccinated. In another small epidemic in a Vermont town in which there were 65 persons exposed to typhoid contagion, 17 developed the disease before any vaccination was suggested. Of the remaining 48, twenty-nine were vaccinated within a week, and no cases occurred among them, while in the 19 who were not vaccinated, 5 cases developed. These instances could be multiplied from the literature, and all would show the remarkable value of the typhoid vaccine in preventing the disease.

THE USE OF ANTITYPHOID VACCINE DURING THE COURSE OF AN EPIDEMIC. The value of this vaccine in preventing typhoid fever for individuals who are vaccinated prior to their exposure to the disease is firmly established. The value of the vaccine in epidemics already developed has not been very extensively studied, although a few important observations have been made, particularly by Russell, Ravenel, and Spooner.<sup>1</sup> The last named had an opportunity of testing the value of vaccine in 65 persons who were exposed to typhoid; 29 of these were inoculated after 17 cases of typhoid fever had been reported and 19 persons refused vaccination. Only one of the 29 inoculated persons (3.5 per cent.) became ill, while 5 of the 19 refusing vaccination developed typhoid fever (26.3 per cent.).

Hunt<sup>2</sup> has made a report on the use of the vaccine in an epidemic which occurred at Troy, New York.<sup>3</sup> This epidemic was water-borne, and traced directly to a typhoid carrier. The vaccine used was a mixture of the typhoid bacillus, paratyphosus A, and *Bacillus paratyphosus* B. The ages of the greatest number of persons vaccinated were between fifteen and thirty-five years, and it is interesting to note that the greatest number of cases occurred between the ages of five and twenty years.

In all, there were 761 persons vaccinated, of which 37, or 4.86 per cent., developed typhoid fever. Twenty-eight of these were taken ill after the first inoculation, 7 after the second, and 2 after the third. Five hundred and eighty-two individuals were observed who were not vaccinated. Of these, 127 developed typhoid before October 14. There were also 455 individuals, who were not vaccinated, who were well prior to October 14, of which 65, or 14.28 per cent., developed the disease. October 14 was the date upon which the first inoculations were given. In individuals who developed the disease after, or during, the vaccination, the onset was prolonged in every case and there was no particular modification of the disease. The shortest was twenty-one days, and the longest thirty-one; a relapse occurred

<sup>1</sup> Journal of the American Medical Association, October, 1912, p. 1359.

<sup>2</sup> American Journal of the Medical Sciences, June, 1913, p. 826.

<sup>3</sup> Journal of Infectious Diseases, May, 1913.



in 6 of the cases. Only one of these individuals died, giving a mortality of 0.27 per cent.

In this epidemic it is apparent that the course of the disease was not modified, as was the case in the epidemic reported by Spooner. The value of the vaccine in the face of a typhoid epidemic is to prevent the disease in those who are not already infected, and, naturally, the sooner it is used the better. When the degree of pollution is very great and the disease liable to develop quickly, it probably will have comparatively little effect, but, in epidemics which develop more slowly, it will probably be of great value. Whether or not the use of the vaccine lowers the resistance during a negative phase, if such exists, is a question which will have to be determined by further study and actual experience with other epidemics.

**BESREDKA'S ANTITYPHOID SERUM.** Andriescu and Ciuca,<sup>1</sup> have reported the results of 17 cases treated with this serum. With one exception, the general condition of all the patients was improved, although there did not seem to be any direct influence upon the course of the temperature. The patients treated were all chosen because of the grave character of their infection, and, out of the 17 cases, but one died. An extremely interesting observation is that twenty-four hours after the subcutaneous injection of the serum they were not able to obtain the typhoid bacillus from blood cultures, and apparently the organisms had disappeared, at any rate from the superficial circulation. With the exception of the fatal case, they were not able to recover the typhoid bacilli from the stools, even by the use of the most careful technique. Even from such a small number of observations, the authors believe that they are justified in recognizing the use of this serum in the treatment of typhoid carriers.

**THE OCCURRENCE OF THE TYPHOID BACILLUS IN THE TONSILS.** There is a considerable difference of opinion concerning the frequency of the occurrence of the typhoid bacillus in the mouth. In 1902, Bendix and Bickel described an inflammation of the mouth in typhoid fever patients in which they found the organism. In the following year, Drigalski was able to isolate the organism from cultures made from the tongue and tonsils. In an epidemic observed by him, he found, in 40 per cent. of the cases, what he described as a typical typhoid angina. In 1908, Manecatidi found the organism in 70 per cent. of the cases of typhoid which were examined, and he believed that this was of considerable value in diagnosis.

Contrasted with these are a number of observations, among which may be mentioned those by Blum, Kathe, and Gaethgens, in which they were unable to demonstrate the organism except in a very small percentage of typhoid cases. F. and L. Schültz<sup>2</sup> made a study of the

<sup>1</sup> *Annales de l'Institut Pasteur*, February 25, 1913, vol. xxvii, p. 170.

<sup>2</sup> *Deutsch. medizinische Wochenschrift*, March 6, 1913.

occurrence of the typhoid bacillus in the tonsils in a typhoid epidemic occurring in Königsberg. Of 37 patients examined, following a careful technique, they were not able to isolate the typhoid bacillus from the tonsil in a single instance. Most of the patients were examined repeatedly, and the authors are of the opinion that, in this epidemic at any rate, the disease was not, nor could not be, spread by the mouth secretions, and that, in controlling typhoid epidemics, the greatest amount of care should be taken to disinfect the stools and the urine; anything that detracts attention from these points is a mistake in typhoid prophylaxis.

**TYPHOID AND MEASLES IN THE SAME PATIENT.** Considerable diagnostic difficulty always exists when two infectious diseases exist at the same time in the same patient. The combination of measles and typhoid may present especial difficulty. Gastrowitz<sup>1</sup> has reported 4 cases in which the two diseases coincided, and all 3 cases were in children. The first patient, three and a half years old, had fever for several days and then developed a bronchitis, and finally, three weeks later, developed a typical measles eruption. The fever continued for several weeks in spite of the fact that the measles eruption faded. The typhoid bacilli were found in the stools of this patient and the diagnosis of typhoid was suspected on account of the appearance of the disease in the nine-year-old sister of the patient.

In the addition to the 4 cases reported by Gastrowitz, there are 3 others to which he gives reference, and it would seem that, judging from the literature at any rate, the combination of typhoid and measles is a very unusual one. The combination of typhoid with scarlet fever, on the other hand, has been often noted.

**Typhus Fever.** I have noted, for several years, the articles dealing with what was first called Brill's disease but which has been subsequently shown to be typhus fever. Brill first described 17 cases in 1898, but in 1910 he was able to collect 255 cases, and the disease has been noted by quite a number of different observers. In 1911, Friedman, of New York, who had had considerable experience, suggested the identity of Brill's disease and typhus fever. Since that time the disease has been more carefully studied, and Anderson and Goldberger established the identity of Brill's disease and typhus fever by immunity experiments in monkeys.

Lee<sup>2</sup> has subjected the medical records of the Massachusetts General Hospital for the past ten years to a critical review, particularly the cases which have been diagnosed clinically as typhoid fever. Of these cases, there were 1404, of which 1306, or 93 per cent., were shown to be typhoid either by the Widal reaction or by the typhoid bacillus of the patient. There were 15 cases of paratyphoid fever, and 28 cases which

<sup>1</sup> Deutsch. medizinische Wochenschrift, August 28, 1913, p. 1673.

<sup>2</sup> Boston Medical and Surgical Journal, January 22, 1913, p. 122.

corresponded fairly well to Brill's description of the disease. In 13 of these cases, blood cultures were negative. These cases were scattered over the years from 1903 to 1912, and 17 of the 28 cases occurred from June to September.

In Brill's series of cases, 62 per cent. were in persons born in Russia, and only 3 of the 28 cases were born in America. The cases varied in duration from seven to nineteen days, and the termination was more or less abrupt in each case. A rash was present in every case. The records usually speak of the rash as rose spots, but there is often a note that the rash is very profuse for typhoid fever, or that it does not seem like the usual rose spots of typhoid fever. In 2 cases, the usual skin condition was considered, by a skin consultant, as that of a drug eruption or syphilis. The study seemed to show in Boston, as in other cities, that mild typhus fever is epidemic, and it would seem to be of particular value to study all cases which do not give a Widal reaction for typhoid or paratyphoid by means of blood cultures.

Anderson<sup>1</sup> is of the opinion that typhus is actually present at all times in certain large cities of the United States, and if one takes the ratio of one case of typhus to 47 of typhoid, as found in Lee's studies during the year 1912, they were of the following number of cases:

Typhoid.	Cases.	Typhus.	Cases.
New York City . . . .	3386	New York . . . . .	72
Baltimore . . . . .	1067	Baltimore . . . . .	22
Boston . . . . .	477	Boston . . . . .	10
Chicago . . . . .	1039	Chicago . . . . .	22
Philadelphia . . . . .	1620	Philadelphia . . . . .	34
Washington . . . . .	607	Washington . . . . .	12

This ratio certainly varies greatly in different places, and in the Jewish Hospital of Brooklyn for three years the ratio was 1 to 2.6 instead of 1 to 47. Anderson suggests, in all doubtful cases, that a guinea-pig should be inoculated with about 3 c.c. of blood, intraperitoneally. The temperature curve in the guinea-pig is quite typical of the disease, and easily recognized. In the class of doubtful cases, one should place all continued fevers which give a negative Widal for typhoid and paratyphoid, and negative blood cultures, and particularly in the cases in which the onset has been sudden,

**Septic Sore Throat.** Last year, in *PROGRESSIVE MEDICINE*, I noted the occurrence and the course of a number of epidemics of what the English call "Septic Sore Throat," which is a form of streptococcus infection of the fauces usually spread through milk or cream. Both the public and the profession have been loathe to accept the facts concerning septic sore throat, and it is for that reason that I call attention to this subject and to the study of an outbreak that occurred in

<sup>1</sup> Journal of the American Medical Association, June 14, 1913, p. 1843.



Concord, New Hampshire, in January, 1912, which is reported in full by Mann.<sup>1</sup> The outbreak was general throughout the city, and 82 per cent. of the cases occurred among the users of milk and cream from one dairy. It is probable that some of the cases classified with other dealers also used cream from this same dairy, since ice-cream and milk from a few drug stores came from the suspected dealer. As a rule, the disease affected the better classes, and Mann supposed that this was due to the fact that they used more cream than did the poorer people. The facts which Mann presents, both in his article and in the illustrations, seem to prove beyond question, that the epidemic was spread by means of infected milk and cream, and much of the milk that was used came from farms in which there was undoubted evidence of the presence of sore throat. This is another reason for the use of pasteurization for all cream and milk supplied to cities and towns.

**Ulceromembranous Angina.** This disease, which was first described by Vincent, and which is generally known by his name, is very frequently overlooked. It is usually seen in individuals between two and twenty-five years of age, and is said to be more frequent in damp weather, especially in spring and fall. It is more apt to develop in individuals who have unclean mouths, or who are suffering from diseases of the mouth. Sometimes direct transmission is observed, particularly by means of drinking vessels, pipes, or pencils.

The disease usually begins as an acute stomatitis, pharyngitis, or tonsillitis, which soon shows the appearance of a false membrane closely resembling diphtheria. It is removed with difficulty and leaves a bleeding surface behind, and, as time progresses, is apt to leave more or less ulceration. As a rule, the disease is either mistaken for stomatitis or diphtheria, for syphilis or occasionally for scurvy. If the membrane is removed, it will recur after a very short time, and one attack of the disease is usually followed, months or even years later, by a second. There is generally little or no constitutional disturbance, but the patient may complain of pain in swallowing, and an examination reveals the patch of membrane. In other cases there is great pain, a fetid breath, profuse salivation, and considerable general disturbance. In these cases, there is usually involvement of the lymph nodes draining the infected area.

Sutter<sup>2</sup> has made a study of 50 cases, and he calls particular attention to the fact that the disease is really more or less common and practically always overlooked, and very few of the text-books devote any attention to it. The organism is generally spoken of as the *Bacillus fusiformis*; it occurs in the form of a spindle-shaped, or fusiform, bacillus or as a spirillum suggesting the spirillum of relapsing fever. These bacilli are from 3 to 10 microns in length, and vary considerably in size and

<sup>1</sup> Journal of Infectious Diseases, 1913, vol. xii, p. 481.

<sup>2</sup> Medical Record, March 8, 1913, p. 424.

shape, even in the same preparation. They stain very much like the diphtheria bacillus and show areas which stain and others which do not stain, giving them a striped appearance; the ends of the organism stain much better than the other portions. Löffler's methylene blue is a very suitable stain, and, unless smears are made directly from the swabs taken from the throat, the organism will escape detection.

Various methods of treatment have been suggested, but removing the pseudomembrane and swabbing with peroxide of hydrogen, either full strength or diluted half with water and then painting the surface with tincture of iodine, is perhaps the most efficient. Following this, a mouth wash of potassium chlorate is perhaps the most efficient thing which can be used. In cases in which there is very much pain in swallowing, orthoform, either in powder or in tablets, may be used.

**Uta.** A short note has been made concerning this disease by Strong and his associates. (See reference to *Verruga peruviana*.) It is a disease which has been known from very early times and it has been believed by some to be a form of syphilis, by others leprosy, and, by still others, lupus vulgaris.

There have been two extensive studies made, one by Tamayo, in 1908; the other by Palma, in 1909. Tamayo regards the disease as a special form of lupus, while Palma believes it to be a specific disease having nothing to do with the maladies mentioned above. The disease produces disfiguring scars, and, in certain parts of Peru, large numbers of inhabitants show the results of former lesions. Strong and his associates believe they have demonstrated that this disease is due to a species of *Leishmania*; they have found the organism in the flagellate stage and they have been able to inoculate animals with it. While not so stated, it is to be presumed that a full report will follow.

**Vaccination against Varicella.** It is a general opinion that any method of vaccination for protecting an individual against chicken-pox is useless, inasmuch as the disease is usually benign, but in hospitals where there are large numbers of children a method of protecting the inmates might have a certain amount of value. Medin and Kling<sup>1</sup> have reported, before the Medical Society of Berlin, the results of their experiments. Their method of procedure is very similar to the method of vaccination first used against smallpox. The lymph is procured from the typical chicken-pox vesicle of recent date. This is opened with an ordinary sterile knife, taking care to avoid hemorrhage, and this lymph is then introduced into the skin of the arm which has been abraded with very light scarification, taking care to avoid bleeding. The wound heals rapidly, and, in the absence of any pus infection, nothing is seen until the eighth day, when there appears, at the site of the inoculation, one or several red papules. On the following day

<sup>1</sup> La Semaine Médicale, October 29, 1913, No. 44, p. 527.

the papules are, as a rule, transferred into typical chicken-pox vesicles. These vesicles are surrounded by a small, red zone suggesting the areola of cow-pox, although not as large in extent. In the course of two or three following days, the red zone increases, and stops when it has reached a centimeter in diameter. It is slightly elevated, with diffuse edges. On the third or fourth day the vesicles commence to dry, the red area grows paler and a small brownish crust is formed, and this is surrounded by an area of skin which is somewhat pale and which desquamates slightly. After two weeks and a half, the crusts separate and leave behind almost invisible marks. Sometimes the papules develop in the same individual with different incubation periods, the first coming out on the eighth, the second on the ninth, the third on the tenth. Exceptionally, the incubation period may be prolonged, thirteen days being the longest time noted.

This method of vaccination has been carried to five generations, and the development is always the same. A large number of the children who were inoculated in this manner, and in whom the papules developed, had previously been vaccinated with ordinary vaccine virus, such as is used for smallpox, so that it is quite safe to say that the virus of chicken-pox and smallpox are entirely different. Of course, the question of the identity of these two viruses is scarcely ever discussed now, but this experiment confirms the findings of other investigations. In most cases the child's health is not disturbed at all. The temperature curve is not changed, although occasionally there is a slight elevation.

In 49 children successfully inoculated, there were six in whom there were red papules and spots suggesting urticaria, and these came out two or three days after the appearance of the vesicles. There was no doubt as to whether this skin manifestation had any direct connection with the inoculation or not, although it is possible that this may have been the skin manifestation of a general infection. Out of 95 infants, in which there was an epidemic of chicken-pox, 31 had been inoculated successfully; only one presented signs of the disease, and others in a very benign form, with very few vesicles and no fever. Out of 64 others who had not been vaccinated, 32 were affected with the disease in a typical form.

**Verruga.** OROYA FEVER. With the opening of the Panama Canal in view, the various diseases which are peculiar to the tropics will become more and more important to those who dwell in the temperate zone, and the various diseases that have been reported from South America will be a matter of special interest. I have commented before upon *Verruga peruviana*, which is also known as Oroya fever. Recently an expedition was sent out by Harvard University to study various tropical diseases; this commission was headed by Richard Strong, and included Tyzzer, Blues, Sellards, and Gastiabura.<sup>1</sup> They have

<sup>1</sup> Journal of the American Medical Association, November 8, 1913, p. 1713.



made a preliminary report which cites briefly the history of the disease and the results of their studies.

The disease has occurred in Peru from the earliest times, and it is supposed that there were thousands of people killed by it some four centuries ago. It is also supposed that the army of Pizarro was very largely affected, and there have been numerous references to outbreaks of the disease and various physicians have described it, among whom may be mentioned Odriozola and Dounon. In 1870, there was a severe outbreak in the workmen who were building the Central Railway between Lima and Oroya, and some 7000 persons lost their lives from the disease at this time, since which the name of *Oroya fever* has been given to the disease. In 1906, 200 men, out of a force of 2000 employed on the same railway, died during the construction of some tunnels.

In 1885, Daniel Carrion, a medical student in Lima, thought to investigate the problem of the transmission of the disease by vaccinating both his arms with blood from a verruga tumor. Twenty-three days later the fever developed, and he died from it a little over a month after the vaccination. This led to the disease being called Carrion's fever. Unfortunately, there is no record of the notes of his experiments and no autopsy was performed, and it seems possible that he may have died of some other infection.

In 1901 and 1902, Barton found a bacillus in the blood of various organs of persons dying with this disease and this organism resembled the colon bacillus, but could be distinguished from it by various bacteriological methods. Subsequently, Biffi, Carbajal, Tamayo, and Gastiaburu studied this same organism. They agreed that it was present constantly in persons suffering from the fever, and was agglutinated by their serum. They did not find it in persons who did not have the disease, and it was not agglutinated by normal serum. *It was absent in persons suffering from the disease when they did not have fever, and, if there was no fever present, the serum from these patients did not agglutinate the serum.* They believe it to be one of the paratyphoid group. Barton thought that a skin eruption was caused by this bacillus, but these later observers were not able to verify this. They believe that the organism is a secondary invader in Verruga and gives rise to symptoms of typhoid fever, which constitutes the *fevre grave* of Carrion.

In 1903, Biffi and Gastriburu noted the presence of granules in the red-blood cells that were stained readily with basic aniline dyes. Barton also noted organisms in the red-blood cells; he believes that they are protozoa, and probably the specific agent of the infection. These investigations were also confirmed by Gastiabutu and Rebagliata. Since then several observers, including the above, believe that these bodies were the products of cell degeneration. Nicolle, Letulle, and others found acid-fast bacilli in the lesions of the skin from patients

with verruga, and Darling suggested that these acid-fast bacilli were really tubercle bacilli occurring in cases complicated with tuberculosis. More recently, Gastiaburu and Rebagliata found, in the liver and skin, in the eruptive phase of the disease, certain bodies which were at times in the leukocytes and at other times free, which, from their staining reactions and appearance, they believe to be organisms probably of the genus *Leishmania*.

The severe type of the disease begins with an initial stage known as the *fièvre grave*. It is characterized by a fever lasting from fifteen to thirty days, profound anemia, prostration, and a high mortality. When the patient does not die, the fever gradually goes down and, the eruptive, or verruga, stage begins. It is generally believed that the patient is sure to recover if the eruption is abundant. A large proportion of cases are of a chronic or mild type in which there is a moderate fever of an intermittent character, pains in the joints, and more or less anemia.

The Harvard Commission studied the fever in the hospitals in the city of Lima and various mountain towns, and they believe that *the disease known as Verruga peruviana is really two distinct diseases*. The first, which may be called Oroya fever, is due to a virus which may be transmitted to animals by direct inoculation and which produces definite lesions in these animals; while the second is due to an organism which is found in the red-blood corpuscles, and this they believe to be sufficiently distinct from other hematozoa to be placed in a new genus. This latter organism has not been transmitted to lower animals. In fresh preparations, the organism is frequently difficult to make out, but, with good illumination, they can be seen as round or rod-shaped bodies measuring from 1.5 to 3 microns; the rounded bodies from 0.5 to 1.5 microns. In the very severe infections, the microscope shows red-blood corpuscles that are invaded by the parasites.

They believe that this organism lies midway between the protozoa and the bacteria, and they suggest for it the name of *Bartonella bacilliformis*, and they give the following description: "The parasites consist of rounded or oval forms or of slender, straight, curved, or bent rods, occurring either singly or in groups, but characteristically in chains of several segmenting organisms, sometimes swollen at one or both ends, and frequently beaded. Reproduction occurs by binary division. They are endowed with independent motility, moving in the direction of the long diameter, living within the red-blood corpuscles of man and producing a grave form of anemia known in Peru as Oroya fever. Stained preparations suggest differentiation of cytoplasm and nuclear material."

VERRUGA PERUVIANA they believe to be entirely distinct from the fever described above as Oroya fever. It is characterized by an eruption on the skin and sometimes on the mucous membranes, especially of the mouth and throat. There are great variations in the appearance,

but, in a general way, the cutaneous eruption resembles somewhat that seen in yaws, but it differs from yaws in various ways and they believe it is neither this disease nor syphilis. In some cases there is a combination of the two infections.

The disease is caused by a virus which produces a characteristic local lesion in rabbits when inoculated into the testes. In rabbits, the incubation period varies from ten to twenty-two days, and they were able to transmit the disease to the third transplantation, which is as far as it had been carried before the report had been written. In dogs and monkeys, the incubation varies from eleven to seventeen days. It may be transmitted by cutaneous and subcutaneous inoculation, sometimes by intraperitoneal injection. In these animals, the lesions sometimes resemble those observed in man. At the time of the report, they had transplanted the disease three times in monkeys. They secured a volunteer, and made a human inoculation from *Verruga peruviana*. A portion of skin lesion from two patients was removed, and in twenty minutes' time the skin of the volunteer over the left shoulder was scarified and portions of the nodules from the verruga patients thoroughly rubbed into the scratches. The scratches healed, and at the end of ten days the skin appeared normal. On the tenth day, two small groups of cherry-red papules were noted at the end of the scratches, and a few days later another group appeared. These increased slowly in size, and some of them were removed on the thirty-fifth day. The blood examination of this person did not show any parasites in the blood, as in the cases of Oroya fever, and there was no very marked or grave anemia. Up to the time the commission reported, there was no generalized eruption, and the person was in good health.

THE TRANSMISSION OF VERRUGA. Townsend<sup>1</sup> has given brief details of some experiments in the transmission of this disease by a biting gnat (*Phlebotomus verrucarum*), which occurs in verruga zones of the Peruvian Andes. The animals used in the experiments were two hairless dogs which were kept chained side by side in the laboratory. The female was used for the transmission, while the male was observed for the control. The animals had been in the laboratory under observation for some months, careful records of the temperature and conditions had been taken, and, on July 11, a subcutaneous inoculation was made in the right shoulder with 1 c.c. of a mixture containing the triturated bodies of 20 females of the phlebotomus species. These had been collected on the night of July 9 and 10 in the Verrugas Canyon. There was no evidence of any blood in the alimentary canals of these gnats. The temperature remained normal, but, on July 10, the bitch was thin and weak, had very little appetite and lacked animation, and was sensitive to handling. The blood showed a limited number of

<sup>1</sup> Journal of the American Medical Association, November 8, 1913, p. 1717.



endoglobules, suggesting those described by Barton. On July 17, there was a typical nodular eruption of the surfaces of the right hind foot, and the blood smear from these showed the bodies described by Darling, but none of the endoglobular form. A few days later, on July 19, the largest nodule was opened, and a smear showed bodies bearing a certain resemblance to the *Leishmania*. The control dog, during this period, was entirely normal. This experiment, Townsend believes to represent the transmission of the disease by the inoculation of the gnat, and further experiments along this line will be undertaken by this investigator.

**Whooping Cough.** THE PATHOLOGICAL LESION OF WHOOPING COUGH. Mallory<sup>1</sup> has reported on the lesions of whooping cough as found in man. As early as 1900, Bordet and Gengou described what is now regarded as the whooping cough bacillus, but they were not able to obtain it in pure cultures until 1906. It was found in large numbers in the sputum in all of the early cases of the disease that were examined. This organism is a minute, ovoid, gram-negative cocco-bacillus that stains lightly by the ordinary methods. They were able to obtain a complement-fixation test by using an emulsion of the organism and serum from a patient's blood. This bacillus has been generally accepted as the cause of whooping cough by bacteriologists, but the medical profession, as a whole, has not paid much attention to it, and Mallory thinks perhaps because it has never been demonstrated in connection with any lesion. Klimenko, in 1908, repeated the work on the discoveries of this bacillus and inoculated monkeys and puppies with pure cultures. The puppies died within the course of a few weeks, and it was possible to obtain the pertussis bacillus again from them in pure cultures. The symptoms in the dogs were coughing and sneezing, but there was no whooping.

Mallory, in the routine work of the Boston City Hospital, in going over a slide from a case of whooping cough noticed what seemed to be minute organisms packed in large numbers between the cilia of the epithelium cells lining the trachea. Better sections and stains showed the organisms to be minute bacilli. They were present in great numbers, dozens to one hundred or more to the surface of each cell. He also examined a section from the trachea of another case in which the disease had lasted six weeks, and found the same bacillus present, but in very small numbers. Lung tissue was examined from three other cases, and showed similar organisms between the cilia of the cells lining the bronchi. They were also found free in the bronchial secretion and enclosed in the polymorphonuclear leukocytes, but none were found within the alveoli. Bronchopneumonia, which so often complicates whooping cough, is probably always due to some secondary invader.

<sup>1</sup> Bulletin of the Massachusetts Medical Society, Medical Communications, October, 1913, No. 2, vol. xxiv, p. 113.

Mallory Believes that the action of the *Bacillus pertussis* is largely mechanical, in that it interferes with the normal movements of the cilia and therefore furnishes a continual irritation which excites coughing. It also produces a toxin which is probably rather mild. This is proved by the slight inflammatory exudation, by the lymphocytosis, and by the production of a specific antibody. They obtained sputum from an acute case of whooping cough and inoculated it into the trachea of puppies and rabbits. The animals were killed, and the respiratory tract studied microscopically. They found bacilli identical in every way with those found in whooping cough and in the same location. After considerable difficulty, three different strains were grown in pure culture. These were also inoculated into puppies and rabbits, and the organism again recovered in pure culture after the death of the animals. Careful control work in the examination of the trachea and the bronchi in hundreds of other diseases in man have not shown any similar changes.

Rhea<sup>1</sup> states that, while reading Mallory's contribution, he was impressed by the general similarity between the disease described and canine distemper, which is common among dogs. He examined a number of dogs, using the same technique as Mallory had used for whooping cough cases. Some of the animals were normal, and others had distemper. The normal dogs showed no changes, while the ones with distemper had lesions similar to those described in whooping cough. Rhea believes that the work on this organism must be done on other animals than dogs, and his work suggests a possible relationship between the *Bacillus pertussis* and the *Bacillus bronchisepticus*, the cause of canine distemper. A similar organism has been found in rabbits suffering with snuffles. This opens up a new line of investigation in whooping cough, and it is possible that a new group of organisms may be formed, including the whooping cough bacillus and some of those which have to do with diseases in animals.

**BRAIN COMPLICATIONS IN WHOOPING COUGH.** The nervous complications in whooping cough have attracted considerable attention from time to time, and the most recent study is by Hada.<sup>2</sup> A large number of different nerve and brain complications have been described by various pediatricists, most frequently convulsions or hemiplegia. Comparatively few studies have been made on the pathological conditions underlying the brain complications, and, in many instances, the pathological findings and the symptoms did not correspond, and the cause of the nervous changes, as observed, has not always been clear.

Hada describes a case of *pachymeningitis productiva interna*. A

<sup>1</sup> Bulletin of the Massachusetts Medical Society, Medical Communications, October, 1913; No. 2, vol. xxiv, p. 113.

<sup>2</sup> Virchow's Archiv, 1913, Heft 2, p. 206.

child, aged one year and two months, began to cough on August 12, and, on August 18, there were four typical whooping cough paroxysms, and, on the same day, a marked convulsion with collapse. The child was treated with camphor, a lumbar puncture was done, and a collection of pus was also found in the middle ear which was relieved by puncture. On August 30, the child developed diarrhea, but after that there was nothing particular in the history, and on October 19, the child was discharged as cured.

When the child returned home, the mother noticed that the tongue on the left side was paralyzed, and that the left arm was not used and was held in a flexed position, while the left leg was stretched straight out. The left arm was found to be spastic, felt cold, and appeared somewhat cyanotic. Subsequently, the child developed a pneumonia in the right lung. On January 12, there was swelling back of the left ear and redness of the skin, and on January 15 there was a marked picture of meningitis from which the child died on January 16. At autopsy, marked meningitis was revealed, with a dirty gray exudate. There was a marked hydrocephalus externa, and an old *pachymeningitis productiva interna*. There was also an erysipelas of the skin of the neck, and a right otitis media. A trifling parenchymatous degeneration of both kidneys was present and some clouding of the liver cells. The bacteria were not found in the sections, possibly on account of not staining because of their having been preserved for some time before examination. A considerable amount of atrophy of the cerebral tissue was found, due to pachymeningitis.

The acute meningitis was evidently due to the ear involvement which followed erysipelas at the close of the child's life. The pachymeningitis must have dated sometime before, and it is quite probable that the hemiplegia noted in the history was due to the pressure atrophy of the brain. Convulsions in whooping cough are not at all uncommon; sometimes they are of such severity as to give rise to the thought that they are due to meningitis, and it is well known that diplegias, hemiplegias, and monoplegias occur in the course of whooping cough, as well as paralytic lesions of a spinal type. Psychoses, neuroses, multiple sclerosis, and Friedreich's ataxia are sometimes observed. Sydenham, as early as 1769, described paralysis in the course of whooping cough, and after the first quarter of the last century it was noted by numerous clinicians. Clinically, these cases are generally regarded as the result of meningeal hemorrhage into the brain or hemorrhage into the meninges.

At the autopsies, various things have been noted. Henoeh, describes one case in which there was marked meningeal symptoms with only edema and hyperemia of the brain. von Jacobson described a case in which there were typical brain symptoms consisting of a left-sided hemiplegia, with involvement of the lower branches of the facial nerve, and conjugate deviation, and when the autopsy was made no changes



whatever were found, either in the meninges or in the brain substances. Similar observations have been made by Hamilton, Schreiber, and others. Henoch advanced the theory that these cases are the result of damage to the ganglion cells due to carbon dioxide poisoning. Many cases of apoplexy have been diagnosed in the course of whooping cough by such good observers as Osler, Sachs, Oppenheim, Fritsche, Charcot, and others, and yet, out of all these cases, there is only one doubtful instance of hemorrhage into the brain recorded. Neurath believed that the paralysis is due to toxic changes of the brain cells brought about by the whooping cough toxin. Punctiform hemorrhages in the cerebrum and cerebellum have been described rather frequently. Hada was able to find four cases in the literature of a large hemorrhage into the brain which were taken to be typical apoplexy, but in not one of the four was there an absence of inflammatory changes, either of hemorrhagic encephalitis or of meningitis. He believes, therefore, that hemorrhagic encephalitis may be regarded as characteristic of whooping cough, as much so as it is of influenza, and he believes that the large hemorrhages described were due to the blood pressure being raised in severe paroxysms, as otherwise only the small punctiform hemorrhages would be found. There are a large number of observations dealing with hemorrhagic encephalitis and brain hemorrhage, but, out of the entire number, Henoch was only able to find two of extradural hemorrhage and 3 cases of meningeal hemorrhage. Henoch believes that all the brain complications of whooping cough are primarily caused by the effect of the whooping cough toxin, which apparently may cause various forms of inflammation, such as encephalitis, meningo-encephalitis, leptomeningitis, and pachymeningitis, and that frequently the inflammation is of a distinctly hemorrhagic character.

**THE CONTROL OF WHOOPING COUGH.** At the meeting of the American Pediatric Society, the President<sup>1</sup> made a plea for more efficient public regulations relative to the control of this disease. There die in the United States, every year, something over 6000 children under five years of age in the registration area, which, roughly speaking, comprises about one-half of the population. In 1910, the Public Health Reports showed that the death rate per hundred thousand was as follows: Whooping cough, 11.4 per cent.; scarlet fever, 11.6 per cent.; measles, 12.3 per cent.; and diphtheria, 21.4 per cent. Morse also secured special information from thirty States which showed that, in 1911, there were 6251 deaths from whooping cough, 4232 from scarlet fever, and 9579 from diphtheria. During the same period there were 3860 children under five years of age that died of bronchitis and bronchopneumonia in the eleven states, and in this same area there were 1216 deaths from whooping cough. It is extremely probable that quite

<sup>1</sup> Journal of the American Medical Association, May 31, 1913, p. 1678.

a large proportion of the cases reported as bronchitis and bronchopneumonia were secondary to cases of whooping cough. Throughout the entire country it seems that whooping cough is somewhat more fatal than scarlet fever, and somewhat less fatal than diphtheria. Curiously enough, in the Southern States, whooping cough seems to be a more serious disease than in the North. Any disease which kills something like 10,000 children every year is a serious menace, and if we were to have as many children die from some other disease, such as cholera or plague, the whole country would be very much disturbed. As in the case of summer diarrhea, the familiarity with the disease and with the deaths resulting from it has led to a spirit of tolerance. In other words, what the people have got used to, they think they cannot change.

Whooping cough is a reportable disease in twenty of forty-three States from which Morse secured information, but, in many of these States, very little attention is paid to the law by physicians. In seven States, isolation is required, and the modified isolation in two others. The disease is placarded in six States. Disinfection after the disease is required by law in four States, and recommended, but rarely enforced, in one other. Practically, both isolation and disinfection amount to very little or nothing at all as ordinarily carried out. In reference to the attendance at school, the laws of the various states are exceedingly variable, and in a very unsatisfactory and chaotic condition. In the cities the condition is rather better, but it would seem that notification is the chief thing done. It seems quite remarkable that children with the disease are allowed to go to school in three of the sixty-one cities which Morse studied. Two of the cities are in Ohio, and one in Mississippi.

As regards hospital treatment, there is practically no provision made for the disease, in a few of the large cities there is provision for taking care of complicated cases. In the new charity hospital in New Orleans there is a ward of eight beds devoted entirely to whooping cough, and one pavillion in the new Cincinnati hospital is to be arranged exclusively for the disease. As a general rule, the hospitals throughout the country refuse to take children suffering with the disease and, when they are admitted by mistake, they are sent home as soon as possible, or, if this is not feasible, they are isolated in separate rooms until they can be removed. In dispensary practice, the disease is still treated in many clinics without any attempt at isolation, but, in a few, there is some effort made to have the patients either come early or late, and in one or two places they are treated at an entirely different hour. One can scarcely imagine a better method of transmitting the disease than have a child with whooping cough in the waiting-room of a children's dispensary, and yet this is done practically over the entire United States. We are not very far behind other countries in regard to our attitude

toward the disease, for practically everywhere the disease is neglected, and isolation and disinfection are either not regarded at all or only in a very rudimentary way.

The organism which causes the disease is most abundant in the sputum in the catarrhal stage, and is also found during the first two or three weeks of the spasmodic stage, although it may be found as late as the eighth week of this stage. It is most easily transmitted during the early weeks, however, and may not only affect children, but domestic animals as well. Animals as the cause of the disease may practically be disregarded, as they apparently only get the disease under rather exceptional circumstances.

Morse suggests that the first thing to do is to convince the physician and the general public of the seriousness of whooping cough in infants and young children, and the importance in protecting them from it. Regulations without interest on the part of the public are useless. It should be made a reportable disease, the house should be placarded, and the sputum and vomitus should be treated in the same way as in tuberculosis. Special hospitals should be provided for cases that cannot be isolated satisfactorily, and children who are allowed to go out of doors should be kept away from other children, and should wear an arm band of some prescribed color so that they may be easily recognized by others. When regulations are disregarded, the health authorities should send the cases to a hospital without regard to circumstance or social position. The bacillus of whooping cough outside the body dies quickly, so that thorough cleaning and airing of apartments is all that is necessary. The other children in the family should not be allowed to attend school until they have already had the disease, or until two weeks have elapsed since the last exposure, provided they are free from catarrhal symptoms. Children with catarrhal symptoms, in whom there is any reason to suspect the possibility of whooping cough, should be excluded from school.

THE TREATMENT OF WHOOPING COUGH WITH APPLICATIONS OF NITRATE OF SILVER. Watson, in the middle of the last century, suggested the use of local applications of a strong solution of nitrate of silver, and, recently, Occhenius, without knowing of the suggestion of Watson, published an article concerning the use of a 2 per cent. solution of nitrate of silver applied systematically to the pharynx. This was done because he thought that the infection was chiefly in the upper portion of the respiratory tract, and also because the astringent action of the nitrate of silver diminished the secretion of mucus, and he believed that this would have reduced the number of attacks of the cough.

Occhenius<sup>1</sup> tried this method of treatment on 107 children varying in age from several months to thirteen years, and, in 84 cases, he believed

<sup>1</sup> La Semaine Médicale, November 26, 1913, p. 569.



he obtained very good results. Sometimes the effect was remarkable. In one child, aged one and a half years, who had had a severe whooping cough with as many as sixty-five spasmodic attacks in twenty-four hours, applications of nitrate of silver brought about a disappearance of all the symptoms in less than three weeks. Generally, by the end of eight days after the treatment has begun, there is a marked diminution, not only in the number, but in the intensity of the coughs. In nervous children, and in the older ones, it is possible that suggestion played a certain part in the good effects obtained. This was not applied to the younger infants. In infants, the strength of the solution was 1 per cent., repeated daily. The child was held firmly, and the pharynx thoroughly painted with the solution by means of a probe covered with cotton. In the older children, these applications were made every two days for two weeks. Sometimes after the first application there would be, on the following day, an increase in the number of attacks, but, later on, there was a marked lessening. In addition to the use of the nitrate of silver solution, a very weak solution of peroxide of hydrogen was used to spray out the nose and throat.

THE VACCINE TREATMENT OF WHOOPING COUGH. Last year, I noted some of the work that had been done on the vaccine treatment of whooping cough. There have been a number of investigators working along this line, among whom may be mentioned Sill.<sup>1</sup> He reports 33 cases of whooping cough treated by this method, and, in all, he believes that the effect of the vaccine has diminished remarkably the number of the paroxysms and the amount of the vomiting. There were no bad effects from the use of the vaccine, no abscesses were formed, nor was there any swelling at the site of the injection. There were no complications of any kind in the cases in which the vaccine was used. The longest time any of the children coughed was twelve weeks and four days, while the longest time any child coughed after it was put under vaccine treatment was nine weeks, the average time being four weeks.

The injections were given every two or three days in most of the severe cases, and in very severe cases every day for a few days until the symptoms were relieved. The milder cases did not receive the vaccine so often, nor so much at a time. Sill states that he used the severity of the disease as a guide more than the age of the child. His youngest patient was one month old and the oldest was six years, but most of the patients were between six months and three years of age. He used the vaccine in doses varying from twenty million to sixty million. He obtained much better results in the cases that were seen early, before the paroxysms had obtained their full height, and he believes that, in all cases, after one to three injections the number and severity of the paroxysms was markedly lessened. Some children seemed to respond

<sup>1</sup> American Journal of Diseases of Children, May, 1913, vol. lvii, p. 379.

better than others, and Sill believes that this is due to the fact that some got a larger dose than others; he noted that the ones who were given larger doses, proportionately, responded much more quickly and had the shortest attacks after treatment was begun. He believes that the correct dosage for mild cases is fifty million bacteria given every other day, whereas, in the severe cases, this amount may be given every day, or one hundred million every other day.

He also tried the effect of giving the vaccine for purposes of *immunizing* other children; in one family, in which one of the children was under the treatment for whooping cough, the others were given doses of the vaccine for a period of two months during which they were under observation. They did not contract the disease, in spite of the fact that they had never had it and were constantly exposed to it. One child of eight years was given four injections of twenty million, while another of nine years got four injections of twenty million for over a period of one month.

This whole question of the vaccine therapy of whooping cough may be regarded as in the purely experimental stage, and anyone who has had much experience with the disease knows how difficult it is to tell whether one is getting good effects from any line of treatment or not.

The hopeful feature of the method is that it seems to be of more service when given early in the disease, for, as a general rule, the usual therapeutic measures are of more value late in the disease than when they are used early, for the reason that the disease has a shorter time to run. Judging from the results obtained by Sill and other investigators, I would be inclined to use larger doses of the vaccine at rather short intervals, inasmuch as no reaction seemed to take place, and certainly the treatment should be begun as early as possible and a careful record kept of the number and severity of the paroxysms and the total duration of the disease. Whooping cough lasts varying lengths of time. Peasants in Bavaria have a saying that "*es dauert bis es aufhört.*" Ordinarily the cases last from one to two weeks in the stage of invasion, from four to six weeks or longer in the spasmodic stage, and a week or two in the decline, making a total of from eight to twelve weeks. If the vaccine is of any real value, this period must be reduced to a very considerable degree in a very large proportion of the cases.

**A SERUM THERAPY IN WHOOPING COUGH.** There have been numerous efforts made to obtain a satisfactory serum for the cure of whooping cough, and one of the most recent is that made by Bordet and Gengou, upon which a report has been made by Vanlair.<sup>1</sup> He reported the results obtained in 71 cases treated by Duthoit, of Brussels. After a single injection of the serum, there is a most favorable abatement of symptoms, the number and intensity of the spasms being diminished and the total

<sup>1</sup> La Semaine Médicale, October 29, 1913, No. 44, p. 528.

length of the duration of the disease apparently was considerably lessened. To obtain the best results, the serum should be injected very early in the disease.

Among the attempts to produce a serum for whooping cough, one must note the work of Klimenko.<sup>1</sup> This serum is prepared by injecting into the veins of horses a suspension of the bacillus of Bordet and Gengou cultivated for forty-eight hours. The injections are begun with cultures that had been heated at 66° C., and later with gradually increasing doses of living cultures every seven days. Thirty-five cases were treated by subcutaneous injection of the serum, and, without exception, Klimenko claims to have had a diminution in the number of attacks of cough and a bettering in the general condition. In about one-third of the cases, the duration of the disease seemed to have been somewhat diminished, but, in a number, there were complications such as are commonly seen in whooping cough, consisting of pleurisy, bronchopneumonia, bronchitis, influenza, and diffuse bronchitis. When these complications were noted, there was usually an increase in the whooping cough symptoms and no diminution in the duration of the disease.

THE FARADIC CURRENT IN WHOOPING COUGH. Hamburger<sup>2</sup> has made a communication to the Medical Society of Vienna concerning the use of the faradic current in the nervous period of whooping cough. For the first four or five weeks of the disease, there is apparently a certain amount of change in the mucous membranes of the bronchi and trachea; following this, the lesions probably disappear, but the spasmodic cough persists, sometimes lasting for very long periods. Hamburger found that, by applying the faradic current over the larynx and about the neck, between 70 and 80 per cent. of the cases were cured after two or three treatments.

The effect of this treatment is probably only that of suggestion, and doubtless will have no effect except in older children. Unfortunately, Hamburger does not give the ages of the cases treated, so that it is not possible to draw any conclusions on this point at this time.

ADRENALIN IN THE TREATMENT OF WHOOPING COUGH. Lord, Fletcher, and others have suggested the use of adrenalin in whooping cough, particularly in the rebellious cases, and claim to have obtained rather remarkable results. Inasmuch as any drug in the pharmacopœia and out of it has been vaunted at some time or other as a cure for whooping cough, one is inclined to be rather skeptical regarding the value of any new remedy unless it is based on some very well-fixed principle. In a disease like whooping cough, however, where one meets with the most distressing symptoms, it is quite permissible to try out any sug-

<sup>1</sup> Archives of Biological Sciences, St. Petersburg, 1912; La Semaine Médicale, October 23, 1912.

<sup>2</sup> La Semaine Médicale, November 5, 1913, p. 540.



gestions that are made. The method is to give three drops of the solution as ordinarily marketed, repeating this at intervals of four hours and subsequently diminishing the dose and lengthening the interval. One should not use a drug like adrenalin over long periods of time as it is capable of producing great changes in the body, especially in the bloodvessels.

**The Dissemination and Prevention of Yellow Fever.** There has been so much written about yellow fever that only a brief note may be made on an interesting article by White.<sup>1</sup> This article is particularly worthy of note, as it shows very well the entire change of conception regarding the transmission of yellow fever. The elaborate quarantine of former days has been done away with, and, in its place, the screening of the house, and particularly the sick-room, and the systematic destruction of mosquitoes has been substituted.

White undertook, in 1905, to eliminate an epidemic of yellow fever in New Orleans, which had presented, up to that time, 600 cases scattered over forty-four miles of territory among a population of 335,000, and with many indeterminate foci. This was done by the immediate isolation of every sick man and his accompanying mosquitoes. This was done as quietly as possible so as not to disturb the patients or the mosquitoes. After the patient had improved he was removed to another room or house and the place occupied by him thoroughly fumigated, using usually sulphur dioxide or cyanide, or burning pyrethrum. The work of stopping this epidemic and clearing up the focus lasted one hundred days and cost about \$325,000, or a fraction of under one cent per capita per diem. This work of eradication was based on the fact that the mosquito was the only disseminator of yellow fever, and the *stegomyia* the only genus of the species proved to be the carrier. The disease is only infective during the first three days of the attack, and the mosquito biting the patient after that attack receives no infection. The infected mosquito itself cannot convey the infection to another human being until after the lapse of at least ten days after the ingestion of yellow fever blood.

<sup>1</sup> American Journal of the Medical Sciences, March, 1913, p. 378.

# DISEASES OF CHILDREN.

BY FLOYD M. CRANDALL, M.D.

PEDIATRICS, like other branches of medicine, shows changes in its prevailing literature from year to year. One who reviews the annual literature expects to find certain subjects dominant, which may have received but slight attention during preceding years. As an example of this tendency, I<sup>1</sup> found it necessary to say three years ago that poliomyelitis had received more attention from pediatricists than any other subject, while the infectious diseases had occupied their attention so largely that the remaining part of pediatric literature had been meager and commonplace. Last year I found that infant mortality had received an exceedingly large share of attention. The Congress of Hygiene and Demography had some influence, no doubt, in stimulating study in that direction. I devoted extended space, therefore, last year to the subject of infant mortality and child welfare. While much has been written during the past year upon these subjects and some knowledge of value has been added, the subject of *eugenics* has loomed large and has occupied unusual attention. The intentions underlying the work on eugenics are of the best, and every observer acknowledges that there is urgent need of knowledge and wisdom along the lines with which it deals. But like all new subjects taken up by enthusiasts, many of the efforts are misguided and are bound to result in misfortune rather than good as intended. The subject receives very judicious comment in an editorial<sup>2</sup> under the title "Misdirected Eugenics." In the end, the efforts to improve the race now classed under the general title eugenics, will work for good and many evils will be overcome. The subject should be handled, however, with much caution. Great wisdom is required, lest, in the attempt to remove one evil, others equally grave be substituted in its place.

**Infant Mortality.** One of the best recent papers on this subject is that of Dr. Josephine Baker,<sup>3</sup> Director of Child Hygiene of the New York Health Department. The efforts made by that department for two seasons past have been through milk stations, together with a system of instructing mothers. "The solution of the problem of infant mortality," says Dr. Baker, "is 20 per cent. pure milk and 80 per cent.

<sup>1</sup> PROGRESSIVE MEDICINE, March, 1911, p. 245.

<sup>2</sup> New York Medical Journal, August 30, 1913.

<sup>3</sup> American Journal of Diseases of Children, February, 1913.

training of the mothers. The infants' milk stations will serve their wider usefulness when they become educational centres for parental instruction, the encouragement of breast-feeding, and teaching baby hygiene, with the mother instructed to buy the proper grade of milk at the place most convenient to her home."

The best definition I have seen of a milk station is that of Waldron,<sup>1</sup> of Yonkers: "Milk stations do not mean simply pure milk, but a combination of good milk, a capable matron to handle it, a place for mothers to bring their strong babies to keep them strong, or weak or sick babies, a nurse to meet them and return to the home to treat the sick baby and teach the mother how to care for and feed the infant, and a physician to oversee, direct, and encourage all. This is what a milk station is in a thickly populated section of the city. Leave any item out and the success of the station decreases." It has been clearly demonstrated in New York city that infant mortality is a public health problem, that it should and can be effectively dealt with by a properly organized department of health. Money wisely expended buys public health as readily as it does any commodity. In the largest city, with the most complex population in this country, in a city where poverty and congestion of population are exemplified in their worst forms, where immigration furnishes a rushing tide that knows no ebb, and where the resulting economic and social conditions baffle our most advanced students of civic problems, it has been shown that the door of hope is open to the littlest of citizens, and that under the worst conditions it is possible to solve at least a part of the infant mortality problem. Our cities are learning that it is not the babies that are born, but those that are saved that count.

Another excellent review of the general subject of infant mortality, substantiated by numerous tables and statistics, is that of Reuben,<sup>2</sup> of New York. The diarrheal and infectious diseases are by no means the only causes of infant mortality. These causes are capable of removal or mitigation. With the recent reduction of death from these preventable causes, deaths from congenital defects and diseases have taken the front place as the cause of infant mortality during the past year. As pointed out in an editorial article,<sup>3</sup> 35 per cent. of such mortality is due to these congenital conditions. These conditions are very difficult to control. Much may be done to prevent some of them or mitigate their results, but the time will never come when they will be wholly removed. The subject has attracted unusual attention during the past year, and was carefully considered at the recent conference on child welfare, held under the auspices of the Health Department of New York State.

<sup>1</sup> Archives of Pediatrics, April, 1913.

<sup>2</sup> New York Medical Record, August 9, 1913.

<sup>3</sup> New York Medical Journal, August 23, 1913.



**Sudden Death in the Newborn.** A case of sudden death in an infant is reported by Davis,<sup>1</sup> of Philadelphia. The child had been delivered by Cesarean section. It was possible that hemorrhage on the part of the mother before the birth of the child had altered the condition of the fetal blood and perhaps had had some influence on the thymus. The thymus, it is certain, was found enlarged. In discussing this case, Griffith<sup>2</sup> observed that the term "thymus death" is an unfortunate one, because it does not always have the same meaning. Death undoubtedly may be caused by the pressure of the thymus gland on the trachea. The majority of so-called thymus deaths have been sudden deaths. There is no anatomical proof of the occurrence of sudden congestion. The most commonly accepted theory of these sudden deaths is that the condition is a neurosis, toxic, perhaps, in origin, and that, for some unknown cause, there is a sudden arrest of the heart's action.

**Asphyxia Neonatorum.** The importance of exact information in cases of asphyxia in newborn infants is very great. Balard<sup>3</sup> reports the use of *Pachon's oscillometer* to determine the presence of heart pulsations. He made observations on four cases. In one case, the child was apparently dead, and the first inspiration was not seen until the end of an hour. The oscillometer proved, however, that there was still life in the heart. Fry,<sup>4</sup> of Washington, refers to the *pulmotor* as worthy of trial in all cases of asphyxia. He has had no opportunity to test it in the serious condition known as asphyxia pallida. In the livid form of asphyxia, however, it has acted promptly, and resuscitated the infant in about five minutes.

Treatment of asphyxia in the newborn with *oxygen* under pressure is reported by Engelmann,<sup>5</sup> who has used the method for three years. A Tiegel mask is fitted over the face of the infant. This mask opens into a rubber balloon containing the oxygen. One tube brings the oxygen into the balloon, the other conveys the expired air into a metal tube which stands upright in a receptacle containing water. The child is wrapped in warm blankets and the mask is applied with the lower jaw drawn forward. At regular intervals the thorax is compressed with both thumbs, which expels the air, while inspiration follows from the forcible entrance of the oxygen under pressure. As a rule, the skin soon grows pink and the child soon begins to breathe naturally, unless there is some injury of the brain from hemorrhage or pressure. This same method was applied, with a larger sized mask, to an adult with paralysis of respiration after stovain spinal anesthesia. The apparatus worked finely during the hour required before danger was past. The method might also prove useful in embolism or severe pneumonia.

<sup>1</sup> Journal of the American Medical Association, March 29, 1913.

<sup>2</sup> Ibid.

<sup>3</sup> Presse Médicale, March 29, 1913.

<sup>4</sup> Journal of the American Medical Association, May 31, 1913.

<sup>5</sup> Medizin. Klinik, March, 1913.

He contrasts the method with Schultz swinging, pointing out its advantages when there are contra-indications to the swinging. He adds that as we are unable to exclude complications of the brain, with certainty in severe cases of asphyxia, it seems wiser to apply this method in every case of severe asphyxia, as the simplest and most harmless means of expanding the lungs and ensuring a regular supply of oxygen.

**Congenital Cyanosis.** Three cases of malformed heart discovered at autopsy are reported by Heuer.<sup>1</sup> Certain conditions were found present in each case. There was narrowing of the pulmonary artery, interventricular communication, displacement of the aorta to the right, hypertrophy of the right ventricle. This combination constitutes the commonest anatomical condition underlying permanent congenital cyanosis. The author discusses the various theories advanced in explanation of these cases, and concludes in favor of the theory of endocarditis during fetal life.

**Jaundice in Infancy.** The jaundice of early infancy is still the subject of observation and discussion. Poynton<sup>2</sup> reports four cases of prolonged jaundice appearing at birth. They were apparently obstructive in nature. After a detailed report, he discusses the general subject, and divides the cases into groups, the first being those dating from birth—somewhat prolonged and apparently obstructive. They are apparently not of the same nature as icterus neonatorum. He notes the absence of splenic enlargement, the slight jaundice, the natural consistence of the enlarged liver. The second group is of alcholemic type, which runs in families with alcholemic jaundice, enlargement of the liver and spleen, and anemia of varying degree. There are two varieties: One a persistent mild jaundice; the other has outbursts of very definite and extreme jaundice.

The subject is also discussed by Unger,<sup>3</sup> who holds that the condition is not physiological. It has been reported to have occurred in 90 per cent. of cases in some localities. In some modern hospitals where thorough asepsis is observed, icterus has occurred in less than 30 per cent. of cases. Among 3856 infants observed by Unger in one clinic in Vienna, but 20.2 per cent. had icterus. The jaundice never appears first in the sclera, as in adults, but is first seen in the skin of the face and buttocks. The soles of the feet and the palms of the hands are only affected in severe cases. The sclera is also only involved in very severe cases. Concerning the prognosis of icterus neonatorum, Unger believes that is by no means a physiological process. Most cases are mild. Treatment consists in giving warmth to the infants and frequent intervals of feeding. Breast milk is very important. If there is vomiting, feeding should be given with a spoon or by gavage.

<sup>1</sup> Presse Médicale, June 28, 1913.

<sup>2</sup> British Journal of Diseases of Children, April, 1913.

<sup>3</sup> Zeits. für Kinderheilkunde, November 16, 1912.

**Congenital Torticollis.** Congenital wry-neck is occasionally reported, but is not frequent. Hematoma of the sternomastoid muscle caused by injury during birth sometimes produces twisting of the neck. This condition should be distinguished from true torticollis. D. M. Greig<sup>1</sup> reports a remarkable family tendency. The grandmother of the family had a left congenital wry-neck. She is able to place her head in a normal position, but as soon as her attention is removed the head inclines toward the left. The first child is normal. The second child has a left congenital wry-neck more marked than that of the mother. It was not troublesome, however, until she was six months old. The third child is normal, but the fourth and youngest has a left wry-neck similar in every respect to that of the elder sister. In both cases, there is a marked contraction and prominence of the sternomastoid muscle. The causes for such peculiar hereditary deformities are of course unknown.

**Tetanus Neonatorum.** A case of recovery from this grave condition in an infant of nine days is reported by Wolff.<sup>2</sup> The child was treated by serotherapy, together with chloral in full doses. Three hundred units of tetanus antitoxin were given in divided doses hypodermically near the umbilicus. The cord had sloughed on the eighth day, but pus soon appeared at its site. The child was fed for a time with breast milk by the stomach tube, but was put directly to the breast as soon as conditions permitted. The convulsions were severe, and the temperature ranged high. The author believes the result was due to the combined action of the serum and chloral, and good feeding.

**Meningeal Hemorrhage in the Newborn.** This condition is frequent enough to warrant consideration by every physician called upon to manage newborn infants. It is commonly due to pressure or injury, which may result from the use of forceps or compression by a long confinement. An excellent article on the management of this condition is that of Doazan.<sup>3</sup> He advocates immediate lumbar puncture in even suspicion cases of meningeal hemorrhage. If this fails to relieve pressure symptoms, he advises puncture of the anterior fontanelle, especially if it is bulging. It is better to give the brain opportunity to develop resisting power before operation for the relief of pressure is undertaken. Puncture of the fontanelle, before lumbar puncture has been advised by Gilles, of Toulouse, who uses a Praves needle which is inserted as far as the longitudinal sinus if possible, passing it 5 or even 8 mm. The blood is then drawn at once before it clots or is absorbed. While the results of such puncture are usually palliative only, it would seem, in some cases, to be of actual curative value. The prevention of cerebral hemorrhage consists in avoiding, so far as possible, every condition which increases the blood pressure within the child's brain.

<sup>1</sup> British Journal of Diseases of Children, August, 1913.

<sup>2</sup> Deutsch. med. Wochenschrift, September 11, 1913.

<sup>3</sup> Archives Générales de Chirurgie, January 7, 1913, No. 1.



**Hemorrhagic Diseases of the Newborn.** This condition is still the subject of many contributions. I<sup>1</sup> gave extended consideration to it three years ago, when the injection of the serum of human blood was first advised by Welch, and treatment by direct arterial anastomosis had been but recently perfected by Carrell. Vincent,<sup>2</sup> of Boston, reports 15 cases, and gives an extended review of the whole subject, with a bibliography. Several of his cases received *animal serum*, subcutaneously, without apparent result, and were subsequently cured by transfusion.

This agrees with the experience of other men, and, without justifying the statement that animal serum is altogether ineffective, it confirms the opinion that *human blood* or its derivatives is more valuable. The good results which have been obtained by Welch in his large series of cases, by Schloss and Commisky, and others who have used whole human blood, is sufficient evidence that these measures are efficacious in checking bleeding. If the bleeding, in many of these cases of hemorrhagic disease, is due to a defect in the infant's blood, it would seem that transfusion is the ideal method, because it restores immediately all the elements necessary for coagulation.

Transfusion possesses the advantage of correcting the anemia by replacing the cellular elements which have been lost in hemorrhage. For this reason, transfusion is the only measure from which results can be expected in severe types in which the patients have been exsanguinated by continuous profuse bleeding. The uniform success which has attended the injection of whole human blood, blood serum, and the transfusion of blood would lead us to believe that the best line of treatment to pursue is a rational combination of all three methods.

In those cases in which the bleeding is rapid and profuse, and which usually are quickly fatal, an immediate transfusion is indicated. Since the disease, however, often begins with trivial hemorrhages, the easier and more simple methods of blood serum are in order. Assuming that these two measures give equally good results, it would be advisable to make the first injection of whole blood to avoid delay, and at the same time to collect enough blood to furnish serum for future treatment. This treatment should be continued if the bleeding stops or is diminished, and the infant's condition remains good.

Another extended article upon the *pathology, etiology, and treatment of the hemorrhagic conditions in children* is that of Soresi,<sup>3</sup> of New York. He refers to the fact that the natural elements to stop hemorrhage are three: (1) The blood coagulates; (2) the blood cannot pass through the coagulum when it is of a certain consistency; (3) the bloodvessel contracts and retracts, tightening itself around the coagulum, so that the blood cannot pass between the intima and the blood clot. In a

<sup>1</sup> PROGRESSIVE MEDICINE, March, 1911, p. 249.

<sup>2</sup> Archives of Pediatrics, December, 1912.

<sup>3</sup> Ibid., April, 1913.

word, the thrombus fits the cut or torn portion of the bloodvessel, which, by its contraction, tightens itself around it. The sealing of a bloodvessel by the coagulum may be compared to the sealing of an elastic bottle with an elastic cork. This comparison will explain also the mechanism of persistent hemorrhage even when there is coagulation of blood. The coagulation may be soft, like a spongy core through which fluid oozes. The elastic neck of the bottle may not have sufficient resiliency to tighten itself around the cork, so that although the cork is consistent enough to prevent oozing of fluid, it oozes between the cork itself and the inside of the neck of the bottle. It can be said, although it cannot be proved, that the causes of bleeding in hemorrhagic diathesis are to be found in the blood itself and in the vessel.

*Prophylaxis* can do little or nothing, except in scorbutus and hemophilia.

As in other pathogenic conditions in which the etiology and pathology are not established, the *treatment* is mostly symptomatic, except in scorbutus where the change of diet is the main indication. Chemicals, such as *calcium salts* and *styptics*, have been found to be of very little value, except in mild cases, which in all probability would have recovered spontaneously. *Adrenalin* has been found useful at times when applied directly to the bleeding points. *Gelatin* and *peptones* have lost favor and are of little service, notwithstanding some reported good results. In scorbutus and purpura, a change of diet and the administration of fresh *fruit juice*, is followed by great improvement and often complete cure. There is no record of cure in cases of Henoch's purpura, although *direct transfusion* done in time might be very valuable.

The *prognosis* is good in mild cases, which often are cured spontaneously; is bad in neglected cases when the loss of blood has been severe, as children do not stand hemorrhage well.

The author strongly favors direct transfusion. He describes the technique of the operation in great detail, and the methods are made clear by admirable illustrations. Space forbids a description of the numerous details and reproduction of the illustrations. The one drawback to the method is clearly suggested by the final remark of Soresi that direct transfusion is not to be undertaken by a surgeon who is not the absolute master of the technique, which can and should be learned on living animals.

The subject of ETIOLOGY OF HEMORRHAGE IN THE NEWBORN is discussed at considerable length by Schloss,<sup>1</sup> of New York, who asserts that the blood shows no constant pathological change. A consideration of the various factors in the causation of these cases forces the conclusion that the hemorrhage is merely a symptom to which there exists a special predisposition during the first ten days of life. On the other

<sup>1</sup> Archives of Pediatrics, April, 1913.

hand, if there is a uniform pathological condition common to all cases, it is at present unknown. The same journal reports the discussion upon the treatment of these diseases by the injection of human serum, the injection of whole blood, and direct transfusion by Dennett, Commisky, Lyle, and Hess, the whole making the most complete presentation of the subject which appeared during the year.

Successful TREATMENT OF HEMORRHAGE FROM THE INTESTINAL TRACT in a newborn infant by the injection of *horse serum* by the New York Board of Health, is reported by W. S. Jennings.<sup>1</sup> The IMPORTANCE OF BLOOD TESTS BEFORE TRANSFUSION is the subject of an editorial comment.<sup>2</sup> This should certainly be done except in emergency cases.

**Pyloric Obstruction in Infancy.** One of the most notable papers of the year on this subject is that of Pisek and Le Wald.<sup>3</sup> It is a comparative study of normal and abnormal stomachs in infancy, and is illustrated by twenty-four especially satisfactory radiographic plates. The findings are so illuminating that the prophecy may be made that in the future every suspected case of pyloric obstruction will be subjected to a radiographic study before a plan of treatment is determined upon, just as to-day no surgeon would think of putting up a fracture without the use of the rays.

The same authors<sup>4</sup> report further studies planned for the purpose of determining, if possible, the normal size and shape of the infant's stomach; its relation to the neighboring organs; the influence of the internal organs on the viscus; its behavior under differing amounts of food; the influence of different types of food, as liquid or solid, acid or alkaline; its peristaltic action; the motility; the passage of food through the gastro-intestinal canal; the application of this knowledge to certain pathological conditions.

These are illustrated by about thirty admirable radiographic plates. One of the most noteworthy observations relates to the rapid passage of food out of the pylorus. In a number of cases bismuth was seen in the duodenum one minute after the food had been passed into the stomach by gavage, the average time being five minutes. In one case of the tobacco pouch, or retort form, the action was not unlike that of a siphon. After the greater part had passed through the pylorus, the emptying action became slower. Except in instances in which semi-solid food (farina and bismuth or cream) was used, the viscus tended to empty itself with remarkable rapidity.

The authors question the advice of those who, like Grulee, recommend placing all infants on four-hour feeding intervals, since a large number of stomachs practically empty themselves within an hour.

<sup>1</sup> Journal of the American Medical Association, April 12, 1913.

<sup>2</sup> Medical Record, October 18, 1913.

<sup>3</sup> Archives of Pediatrics, December, 1912.

<sup>4</sup> American Journal of Diseases of Children, October, 1913.



In abnormal cases, such as chronic disturbance of nutrition, the stomach begins to empty itself very rapidly, and the emptying time is still shorter. The upper border, or small curvature, may or may not be seen in the radiograph, while the lower border is formed of an indeterminate portion of viscus.

Of particular interest, from the standpoint of diagnosis, is the position of the pylorus. In the majority of cases it is found comparatively high and behind the pyloric third: At times, the position cannot be determined even though the food and bismuth has passed out of the viscus. This is especially true in the tobacco-pouch form, in which the pylorus is forced posteriorly.

Cowie,<sup>1</sup> of Ann Harbor, reports an interesting study of the significance of the pyloric reflex in true and pseudo-pyloric stenosis in infants. His design is to show how a regard for the opening and closing pyloric reflexes may serve us in the medical cure of pyloric stenosis in young infants. It has been known for a long time that lavage and the anti-acids have been useful and effective in these conditions, and the explanation of their beneficial effects have been well interpreted. There are, however, a few principles which may be said to be practically new which are not generally considered, and which make the interpretation of previous success still more clear. These are the factors which govern the opening and closing of the pylorus. While we have no definite comparative experiments to prove it, it might be well argued on clinical grounds that in the condition of hyperchlorhydria accompanying a hypertrophic stenosis of the pylorus, or a stenosis from any other cause in that stage of the disease when spasm can be demonstrated, the irritated tissues respond more quickly to the stimuli. We should at least be able to demonstrate in a stenosis which is not complete, yet of marked degree, whether or not the reflex mechanism is still intact.

In the normal infant's stomach, an antacid may be employed to keep the pylorus closed and thus impede the passage of chyme from the stomach by its action in delaying the opening reflex. Under certain conditions a paradoxical reaction may be said to take place; that an antacid may be employed to facilitate or expedite the passage of chyme from the stomach. When, for example, an antacid is added in proper amount to a hyperacid stomach, instead of delaying the opening reflex, as is the case in the normal stomach in which achlorhydria is the rule, the opening reflex is brought into play and kept in activity by a series of short duodenal closings. Thus, during the first part of digestion one could expect the stomach to empty itself quickly; during the latter part, when the acidity has reached its height, more slowly. The question as to whether or not we are dealing with a hypersecretion or a simple hyperchlorhydria is at this point of particular importance and should

<sup>1</sup> American Journal of Diseases of Children, March, 1913.

be determined. In the former condition the continuous flow of gastric juice leaves, in an otherwise empty stomach, an acid fluid, which, if neutralized before the food enters, would, theoretically, facilitate at least a second or third pyloric opening. With an antacid duodenum a pyloric opening should come as soon as the acidity of the chyme reaches a certain point, and that point in the infant is before the appearance of free acid. When free acid appears, the duodenum closing is prolonged, depending on the ability of the duodenum to dissipate its acquired acidity. Cowie believes that a very large percentage of the cases of infantile pyloric stenosis and pseudostenosis is associated with hyperchlorhydria than is usually conceded.

An interesting case of relief of pyloric stenosis under medical care is reported by Lefcoe,<sup>1</sup> of Philadelphia, which shows what patience combined with determination and skill can effect. Strauch,<sup>2</sup> of Chicago, also reports a case of marked relief under medical care. The symptoms of improvement and cure in such cases are as follows: The vomiting lessens and finally ceases; the stools occur spontaneously, and become of normal appearance; the peristaltic contractions of the stomach are less marked, less strong, and disappear gradually, though their complete disappearance may not be noted until after several weeks or months; the discomfort, pain, and whining cease. The nutrition improves slowly at first; the color and the whole appearance of the child become healthy, and, finally, no evidence of the former misery and suffering is found.

After reviewing the subject of congenital pyloric stenosis, Hammond,<sup>3</sup> of Philadelphia, expresses the belief that early recognition of the nature of the condition and prompt operative treatment, before tissue-cell resistance has too greatly ebbed, should result in the recovery of at least 80 per cent. of these patients.

**The Radiograph in Pediatrics.** An unusual number of articles reporting the use of the radiograph in pediatrics have appeared during the past year. Among these is an admirable series of studies of the gastrointestinal tract in infants by Chapin.<sup>4</sup> He observed particularly the sigmoid flexure and its remarkable variations both in form and situation. From these and other studies it is evident that it is rarely, if ever, possible to pass a tube through this structure. Nothnagel and Boas years ago held that a tube could not be made to pass the sigmoid, and, later, Lilienthal, in 1906, verified this fact by radiographs. The tubes could be passed only to the apex or bend of the sigmoid flexure, when they impinged on the wall, the long mesentery stretching out like a fan, permitting no further progress. Still later, Soper reported 60 cases in which the tube was always found coiled up in a dilated rectum.

<sup>1</sup> Archives of Pediatrics, August, 1913.

<sup>2</sup> Medical Record, August 30, 1913.

<sup>3</sup> Therapeutic Gazette, October, 1913.

<sup>4</sup> Journal of American Medical Association, October 18, 1913.

In only one case was he able to introduce a tube higher than the dome of the rectum, and this proved to be Hirschsprung's disease. These observations are confirmed by Chapin.

Another series of observations is reported by Morse<sup>1</sup> who is impressed by the great assistance that may be rendered by the radiograph in differentiating intussusception from infectious diarrhea, in both of which conditions there is blood and mucus in the stools. In some cases of intussusception, the radiographs taken after a bismuth enema show a cup-shaped cap of bismuth about the lower end of the intussusceptions, while in infectious diarrhea the bismuth is generally disseminated throughout the colon. Unfortunately, however, the picture is not always so plain in intussusception and it is impossible to be certain whether it is or is not present. These examples are sufficient to show how useful the Röntgen ray may be in the diagnosis of obscure abdominal conditions in childhood and to illustrate how varied the conditions are in which it is of service. There are probably also many other conditions in which it will prove of equal value.

**Coagulation Time of Blood in Infants.** Extensive studies upon this subject are reported by Carpenter and Gittings,<sup>2</sup> of Philadelphia. These studies, together with results published by others, lead the authors to emphasize certain facts: First, that in each individual disease the maximum and minimum figures show a wide variation. It is easy to see that the possibility of such variation in a selected case would be apt to negative the result; for example, in the normal case they find a range of from five to fourteen minutes. Either figure by itself shows a far greater variation from normal than the average figure for any disease. Second, the various diseases show average differences which can hardly be considered of any real importance, especially in view of the before-mentioned variation in the individual case. The average figures show much less variation than those for the individual. It seems improbable that any important variation exists in the mere time of the coagulation of the blood in diseases other than of so-called hemorrhagic type. This opinion may be qualified by the statement that average differences of one, two, or three minutes can hardly be construed as of any practical importance, especially when we consider the limitations and variations of the great majority of the so-called clinical methods. The chief value of the latter may be for comparison, yet, even in this case, the results must be interpreted with caution, since the normal variation is so great.

**Blood-pressure in Infancy.** Very few observations have been made upon this subject. H. K. Hill,<sup>3</sup> of Philadelphia, reports investigations made upon babies suffering from gastro-enteritis. The average blood-

<sup>1</sup> Journal of American Medical Association, October 18, 1913.

<sup>2</sup> American Journal of Diseases of Children, January, 1913.

<sup>3</sup> Archives of Pediatrics, August, 1913.



pressure among healthy normal children, according to Seiler, using the Riva-Rocci instrument is as follows:

In children aged from two to three years, the maximum	
systolic pressure is from . . . . .	75 to 80
Four to five years . . . . .	79 " 90
Six to seven years . . . . .	85 " 95
And so on up to fifteen or sixteen years . . . . .	103 " 120

Results obtained by Cook and Briggs, using their modification of the Riva-Rocci instrument, are slightly higher. There seems to be no direct relationship between the blood-pressure and the pulse rate, as the pulse rate is much less stable. Mackenzie, of Aberdeen, in observations made some years ago upon the use of saline solutions in epidemic diarrheas, concluded that collapse in epidemic diarrheas is due to the low blood-pressure and accumulated toxins. The results obtained from injection fluids are increased blood-pressure and the passage of those toxins. The price of isotonic sea-water plasma prohibits its use among poor cases, while in saline solution we have a highly satisfactory substitute. Subcutaneous injections of saline solution should be resorted to upon the earliest indications of collapse, and in the case of very young infants at the first visit, whether collapsed or not. He believes that the key to the moribund conditions in epidemic diarrheas is anuria, which is caused by the lowering of the general blood-pressure, and especially that of the kidneys. Injection of normal salt solution or sea-water plasma raises the blood-pressure, and in this way rather than from any condition of the fluid, causes immediate improvement. This is due to the increased amount of urine at once voided and the carrying off of a large amount of accumulated toxins.

In the 25 cases of gastro-enteritis studied by Hill, all in infants under two years, he had difficulty in arriving at definite conclusions. He seems to have found a rather higher blood-pressure than have other observers, and is inclined to conclude that blood-pressure in infants can never have the importance that it has in adults, principally because of the absence of arteriosclerosis and its causes.

**Gastric Secretion of Infants at Birth.** Some very careful observations upon the gastric secretion of infants during the first few hours of life are reported by Hess,<sup>1</sup> of New York. None of the fifty-five infants were over eighteen hours old, and none of them had received any food. These observations seem to warrant the conclusion that newborn infants regularly secrete a considerable amount of hydrochloric acid before they are given any food. Among these infants, varying in age from one-half hour to eighteen hours, only one did not have hydrochloric acid in the stomach; in all but one, free acid was obtained. The hydrochloric acid varied greatly in amount. Exceptionally it

<sup>1</sup> American Journal of Diseases of Children, October, 1913.

was found almost lacking on repeated tests (congenital hyperchlorhydria or hypersecretion). In almost all cases, acids were obtained throughout prolonged tests in spite of the fact that food was not given to stimulate secretion. In one instance, 17 c.c. of highly acid juice was aspirated in one hour and fifty minutes. Rennin, pepsin, and lipase were also obtained in the unfed newborn.

Prevailing physiological views cannot account for the gastric secretion after birth. It is not the result of mechanical stimulation by means of the catheter, as the juice was obtained immediately on the introduction of the tube, without an intervening latent period. It may be prenatal in origin. Nor is it clear what stimulates the continued secretion which continues for hours. Experiments showed that the saliva is not the exciting agent. The effect of sucking could not be determined. Comparative tests of the same infants at birth and later during the first week of life, showed that the stimulus to gastric secretion may be greater in the newborn infant which has not been fed. This chlorhydria of the newborn is not usually associated with increased tonicity of the pyloric sphincter, as the duodenal catheter can readily be passed through the pylorus. Even when 0.4 per cent. hydrochloric acid is instilled into the gastric cavity, the catheter can be readily passed into the duodenum. However, the high acidity may at times be related to the pylorospasm or to duodenal ulcer met in infancy. Although gastric secretion is so well marked in the newborn, duodenal and pancreatic secretion is very scanty. Nor can this secretion be readily stimulated by allowing hydrochloric acid to enter the duodenum. Evidently the mechanism of the pancreatic secretion is not as easily activated in the newborn as in later infancy.

**The Stomach in Childhood.** Two series of observations during the past year are worthy of special notice. Sever,<sup>1</sup> of Boston, studied the *position of the stomach in relation to posture*. The observations were extensive, and the article elaborately illustrated. From these studies it seems possible to conclude that the average position of the stomach is much lower than had been previously suspected, and that to find a stomach at or well below the crests of the ilium is not unusual. But one of these children had symptoms due to a dilated colon, which condition caused chronic constipation. As seen in these series, the stomach was generally large and either of the horizontal or the sink-drain type. The ideal so-called cow's-horn stomach was rare. Sever does not believe that posture in children, apart from the erect position of human beings in general, has nearly as much to do with ptosis as has formerly been believed. The child's stomach is lower than we generally suppose, and to find a stomach low in a child, does not, therefore, mean that there is a pathological ptosis.

<sup>1</sup> New York Medical Journal, September 20, 1913.

The second paper was by Ladd,<sup>1</sup> of Boston, on the *gastric motility in infants* as shown by the radiograph. One of the most striking things observed is the curious lack of peristalsis to be seen in infant's stomachs as compared with adults. In a case of normal digestion, if the plate is clear-cut, bismuth appears in the small intestines as soon as the feeding is completed, showing that a considerable amount of food passes into the duodenum without undergoing gastric digestion. The stomach appears to empty itself of the greater part of its contents in from one and one-half to two and one-half hours, the emptying process being more rapid in some cases than others. After a greater part of the stomach contents has passed into the small intestines, a considerable residue remains, which is emptied very slowly, often remaining from four and one-half to five, or even seven and one-half hours, in both breast-fed and bottle-fed babies.

When a bismuth feeding is given and another feeding follows at the end of the regular two and one-half or three-hour interval, the bismuth residue from the first feeding does not appear to mix intimately with the new feeding, but, as a rule, passes out into the small intestines much more quickly than it does when it is left to itself. The suggestion is strong that the distention of the stomach by a new feeding, if not excessive, stimulates peristalsis and favors the expulsion of the stomach residue into the duodenum. On the other hand, if the distention is excessive, peristalsis may be inhibited, and the emptying time of the stomach be delayed. In congenital pyloric stenosis, the dilatation and peristalsis is marked; the pyloric end showing the same prow-like formation seen in adults. After a posterior gastro-enterostomy, the stomach appears to expel its contents through the artificial opening quite as rapidly, if not more so, than in the normal stomach.

As the opening of the pylorus is dependent on the secretion of hydrochloric acid in the stomach, the early appearance of bismuth in the intestines and the expulsion of the major part of the contents within two hours would suggest that the bismuth does not of itself interfere with the normal motility of the organ. Moreover, the plates show in one instance that the bismuth had disappeared from the stomach, on one experiment in two and one-half hours, in another in seven and one-half hours, the difference in the emptying time being due presumably to differences in composition of food, the amount of bismuth being the same in both cases.

In further studies upon this subject, Ladd<sup>2</sup> found that the emptying time on breast milk was five and one-quarter hours. With a whey mixture of low casein percentage, the emptying time was three and three-quarter hours, and three and one-half hours less than breast milk. When the proteins were raised to 3.5 per cent., the emptying time rose

<sup>1</sup> American Journal of Diseases of Children, May, 1913.

<sup>2</sup> Archives of Pediatrics, October, 1913.



to six hours plus—nearly one hour more than on breast milk, and nearly double the time required when the casein was .60 per cent. When the protein was given in the form of precipitated casein (lactic acid milk), it was three and one-quarter and three and one-half hours only as compared with six hours when no effort was made to alter the curd. With barley starch the emptying time was the same as on breast milk, that is, five and one-quarter hours. The most rapid emptying record occurred when the mixture was made up from dried precipitated casein. In this case, it required only two and one-half hours. One cannot draw definite conclusions from such a series of cases, but the suggestion is strong that the casein of cow's milk, when given in high percentages, has a decided action on prolonging the emptying time of the stomach. If this casein is precipitated outside of the body, the emptying time is greatly accelerated. The presence of fat has no retarding action, and in some cases seems to favor the exit of the stomach contents. There is some reason to believe that barley starch renders the food more easy of exit.

**Heart Disease in Children.** A series of 197 cases of endocarditis in children is reported by Gilbert,<sup>1</sup> of Boston. His conclusions are in accord with most modern writers, namely, that this condition should be treated a much longer time than is usually done. He believes that treatment should be carried out over months, and perhaps years until all acute signs of disease have disappeared. Even until adolescence is passed, a certain amount of restraint should be exercised.

With this teaching I would fully agree. The results of long treatment even in mild cases of endocarditis, have been so satisfactory, that I feel that practitioners cannot be too strongly urged to insist upon it. Valvular disease extending through years and resulting in the loss of promising lives in early adult life is so serious that a few additional weeks or even months in bed seem to amply repay the effort. The same ground is taken by Blind,<sup>2</sup> who reports three marked cases. He points out the fact that the evolution of the endocarditis is very slow in such cases. The patient should be kept under supervision a long time and frequently examined by auscultation and the thermometer. The latter will reveal slight attacks of intermittent fever testifying that the endocarditis is still at work. The prognosis is difficult, as mild endocarditis may leave irreparable valvular disease while extremely serious forms may heal without a trace.

A discussion upon this subject is reported by the *Lancet*.<sup>3</sup> Particular emphasis is laid upon the fact that rheumatic fever in children affects not only the endocardium, on which lesion most emphasis is usually laid, but also the muscular substance of the heart, and further, that it

<sup>1</sup> Boston Medical and Surgical Journal, July 10, 1913.

<sup>2</sup> Annales de Méd. et Chirur. Infant., July 1, 1913.

<sup>3</sup> *Lancet*, February 15, 1913.

is almost as essentially a disease of the heart as it is of the joints. Consequently it is to be assumed that there is some affection of the cardiac muscle in all cases, even when none of the accepted signs of such involvement are to be discerned. The influence of this on the treatment of the disease is noteworthy, as it involves the enforcement of a complete rest, even after the fever and other symptoms have subsided. It can hardly be doubted that such care is called for in all cases of acute rheumatic disease in children, and that many cases of chronic incurable valvular defects, which at present are so common, might have been avoided.

A point upon which opinion is divided, and upon which the truth can hardly be said to be established, is the question as to the existence of the functional disorders of the heart in children. This is stoutly affirmed and denied, some regarding almost all irregularities of rhythm as indications of myocardial disease, others holding that they are frequently of little importance. Probably the truth, as usual, lies between the two extreme views. It is necessary to distinguish the different groups of cases in which irregularities of rhythm occur, those which are purely physiological or due to temporary nervous disturbance being separated from those which imply organic lesions of the heart. For this purpose it is important not to lay too much stress upon individual signs, but to study all the features of the case. This is equally true in dealing with murmurs, which have gained an undue prominence in medical thought owing to the ease with which they can be recognized and demonstrated to medical students. More important in many cases than such auscultatory signs are the evidences of cardiac insufficiency afforded by respiratory distress on slight exertion, and by dilatation of the cavities of the organ.

In discussing the prognosis of heart disease in children, Cautley<sup>1</sup> believes that the outlook depends upon the degree of involvement of the cardiac muscle. In children it has not the same power of resistance as in later life and its work is greater. Its ability to compensate depends upon the extent and type of the lesion as shown by the number of valves affected and the type of the lesion. The gravity increases with the number of valves affected. Stenosis is always more grave than regurgitation. Cardiac pain must be regarded as a sign of undue strain upon the muscle.

In an exhaustive study of 300 patients admitted to the Boston Children's Hospital, Dunn<sup>2</sup> gives particular attention to mortality and prognosis. He concludes in general terms that rheumatic fever is much the commonest cause of cardiac disease in childhood. Cases with acute rheumatic infection localized in the heart are much commoner than cases suffering from chronic endocarditis. Cardiac symptoms are due to two causes: (1) Acute infection localized in the heart; (2)

<sup>1</sup> American Medicine, June, 1913.

<sup>2</sup> American Journal of Diseases of Children, August, 1913.

broken cardiac compensation. Of these, the first is the commoner. The liability of children to recurrent attacks of acute rheumatic infection, in any of which the heart may be involved, is very great. The immediate mortality of rheumatic cardiac disease is about 20 per cent. The subsequent mortality of patients with endocarditis of rheumatic origin, followed for at least ten years, is about 50 per cent. The final mortality of rheumatic fever followed for at least ten years is 60 per cent. The mortality is seen chiefly during childhood. The mortality after young adult life is reached is only 7 per cent.

The cause of death is heart failure. The cause of the heart failure may be either acute cardiac infection or broken compensation. In childhood, the former cause is far more common. After adult life is reached, the latter cause is more common. The particular valvular lesion present has little or no relation either to mortality or the amount of disability in adult life, except that aortic disease appears to be a particularly fatal lesion in children. The causes of the great mortality of cardiac disease in children are: (1) Their greater liability to this infection; (2) their greater liability to recurrent attacks; (3) their greater liability to cardiac involvement. Patients who escape the dangers of childhood and enter adult life, are apt to show remarkable freedom from disability. The majority of such patients can lead normal, active lives. The probable cause of this freedom from disability lies in the fact that the cardiac damage occurs during the period of growth, and during this period a particularly perfect adaptation can take place between the heart and the patient, which enables the heart to meet the demands made upon it. The earlier in life the cardiac lesion is acquired, the better is apt to be the result in adult life, as concerns the ability to lead a normal, active life; provided that the patient escapes the dangers of childhood. Treatment should be directed toward favoring the adaptation of child and heart. While guarding against overstrain, we must avoid too great limitation of the normal activities of childhood.

**Hernia.** A simple aid to replacing hernia in infants is described by Nussbaum,<sup>1</sup> who observed that blowing in the faces of crying infants causes them to be quiet at once. The author made use of this expedient in the case of a little patient aged three months, who had been suffering with an irreducible hernia for nine hours. It was situated in the right inguinal region and contained a portion of intestines the size of a plum. The infant was placed with the buttocks slightly elevated, and while forcible puffs were blown into its face by the operator, the child stopped crying, and the abdomen became relaxed. The blowing was kept up while the hernia was slowly but steadily being replaced by taxis and retained in position by a band of adhesive plaster which prevented relapse. This method of blowing may also be utilized to facilitate palpation of the abdomen in crying infants.

<sup>1</sup> Münchener medicin. Wochenschrift, July 1, 1913.



**Urinary Lithiasis in Infancy.** It was held in former times that this condition was not common in infants. The more accurate observations of recent years, however, has shown that this idea is not warranted. Holt, basing his information on 1000 autopsies, says that renal calculi are very common in infants, but they are probably voided during the first two years of life because of the fluid diet. Civiale found that 45 per cent. of 5900 cases of calculus occurred in children, and that children under five years of age are especially prone to the condition. A high percentage of the known cases appear to be those discovered at autopsy. Charvin, and several others, incline to believe that renal stone in children is a rare condition. Rafin, who collected 39 cases in infants and children, either operated on or found at autopsy, says the small number of cases attests the rarity of the surgical form of renal and ureteral calculus during infancy. Durand-Fardel and Civiale believe that nephritic colic in infants is not a rarity. Gibbons reports 6 cases in infants of nine to thirty-two months. Bokay has collected in Hungary some 1836 cases of urinary stone in infants and children of ages ranging as high as fifteen. Of these, 45 were twelve months of age or under.

After extended study of literature and considerable personal experience, Collins,<sup>1</sup> of Duluth, concludes that, in the past, urinary lithiasis, especially renal, has been accompanied by a high mortality. Of the cases of renal calculus in children five years or under, more than 90 per cent. were two years or under, and practically all of them were postmortem cases. There is a paucity of case reports of renal stone in infants discovered and treated surgically during life. Calculi discovered in older children or in adult life frequently originate in infancy or childhood. The finding of sand or gravel in infant urine is sufficient reason for advising radiographic examination of the urinary tract. Gravel may be of long duration, ranging from six months or less to forty-one years. Diseases of the respiratory tract are associated with urinary stone or hydronephrosis most often. Bilateral or multiple calculi in the urinary tract offers a condition with an unfavorable prognosis. To better the prognosis, cases must be discovered and treated earlier, before destruction of kidney substance progresses to cripple the organ, or infection becomes a complication. Surgical interference is an accredited procedure. When multiple involvement exists, operation in successive stages may be done. Greater responsibility is attached to nephrectomy in the infant by reason of the difficulty of ascertaining the functional capacity of the opposite kidney.

**Anemia in Infancy.** Two unusual cases in which anemia and enlarged spleen of the type seen in Banti's disease are reported by D'Espine<sup>2</sup> in children of seven months and fifteen months. Stress is laid upon the

<sup>1</sup> American Journal of Diseases of Children, October, 1913.

<sup>2</sup> Revue Méd. de la Suisse Romande, May, 1913.

fact that the spleen should be investigated in cases of anemia, even in infancy. It is possible that cases of Banti's disease are overlooked or mistaken for other conditions with enlarged spleen. The chlorotic type of anemia in young children is the subject of a paper by Mathilde de Bieher<sup>1</sup> who defines it as a state in which there are pallor, digestive, circulatory, and nervous symptoms, and a marked loss of hemoglobin, with a normal number of red cells. Cure is rapid after appropriate treatment. The internal organs are normal; there are anemic murmurs in the heart and vessels of the neck. The appetite is capricious, constipation is the rule, there are rarely vomiting and diarrhea. The child is apathetic, quiet, and sleeps poorly. This condition results when only milk is used, or when it is continued too long. Predisposing factors are heredity, anemia of the mother, overwork by the mother, bad hygiene, and poor food.

**Fever.** **OBSCURE HIGH FEVER.** It is a well-known fact that trivial causes will cause a rise in temperature in some children, while all children are more susceptible to such influences than adults. Pisek<sup>2</sup> holds that no fever in a child should be considered obscure until the ears, blood, and urine have been carefully examined. He arranges the causes of obscure fever in three groups: Those that may be cleared up by a thorough physical and chemical examination; those in which the disease is in its early stages and has not sufficiently developed; uncommon diseases, but important from the standpoint of treatment. The point made is, that the more thorough the examination, the more rare is "obscure fever."

**SALT FEVER IN INFANTS.** Jorgensen<sup>3</sup> reports experiences and experimental research which have apparently established the fact that the rise of temperature in infants after the injection of salt solution is due to the same cause as the somewhat similar disturbances after the injection of salvarsan in some cases, namely, to contamination of the water vehicle by the presence of toxic substances in the water. The bacteria are killed by the preliminary sterilization, but the bodies are left, and this is sufficient to explain the "salt fever" in infants and the *Wasserfieber* after injection of salvarsan. His findings call for a revision of all the work on alimentary fever in infants, as he found that the rise in temperature followed constantly when the salt solution was made with distilled water which had stood for some time, while it was never observed when the water was freshly distilled. Consequently the statements as to the danger of salt solution subcutaneously infused in infants are shown to be unfounded if the water is free from bacterial contamination.

<sup>1</sup> Arch. de Méd. des Enf., March, 1913.

<sup>2</sup> American Medicine, June, 1913.

<sup>3</sup> Ugeskrift for Læger, July 17, 1913; Journal of the American Medical Association, August 23, 1913.

**Discipline of the Sick Child.** The importance of discipline to the well-being of the healthy child, and still more of the sick child, is recognized by every physician. Most physicians have believed that they have seen children sacrificed, because total lack of discipline has rendered it impossible to do what should have been done. In an article on this subject, T. W. Clark,<sup>1</sup> of Utica, sums up the matter so judiciously that it seems to me worthy a place in these pages: "A healthy child needs discipline, an ill child needs it more, and a nervous, spoiled child needs it most of all. By being strict with a child you increase its chance of recovery from an acute illness, you make the household more habitable, you make the child himself happier, you make his school life more profitable, and, most important of all, you destroy the cocoons which, if allowed to develop, will in later years hatch out into the devastating lights of neurasthenia, hysteria, and even insanity. Above all things, let us do away once for all with that pernicious admonition to parents: 'Your child is nervous; he must not be crossed.'"

**Metabolism in Children.** Observations of the metabolism of the child with complete absence of bile from the intestine are reported by Parker,<sup>2</sup> of Boston. He concludes that under such conditions the nitrogen metabolism is normal while the fat metabolism is greatly reduced, for the presence of bile is necessary to normal fat metabolism. A child, not otherwise ill but unable to digest fat on account of absence of bile from the intestine, can, if stomach and pancreatic functions are normal, digest sufficient protein and carbohydrate to maintain nitrogen equilibrium and gain weight. The negative urobilinogen test is evidence of complete absence of bile from the intestine. After a study of the influence of activity on the metabolism of the child, Schloss and Murschhauser<sup>3</sup> refer to the great importance of observing the movement and behavior of children during the carrying out of metabolism researches.

**The Pancreatic Ferments in Infants.** This subject has received considerable study by Hess,<sup>4</sup> of New York. About a year ago he studied particularly the pancreatic secretions in chronic malnutritations of infants and found that ferments of the pancreas are normally secreted even in advanced instances of marasmus or atrophy. In the present study of acute intestinal indigestion, or alimentary intoxication, which was carried out also by the direct method, by the use of the duodenal catheter, the lipase was found deficient, although the two other pancreatic secretions were found present in considerable amounts. The deficiency of lipase seemed to be to some degree characteristic of the disturbance. It is not characteristic of all febrile conditions, and was not met with in pneumonia or empyema. It is possible that the lack of lipolytic activity in this disease should be correlated with the clinical manifesta-

<sup>1</sup> New York State Journal of Medicine, August, 1913.

<sup>2</sup> American Journal of Diseases of Children, May, 1913.

<sup>3</sup> Ibid., July, 1913.

<sup>4</sup> Ibid., March, 1913.



tion of fat intolerance, and the metabolic changes showing a deficient absorption of fat.

**Casein Curds in the Stools of Infants.** After considerable observation upon this subject, Hess,<sup>1</sup> of New York, comes to the conclusion that the large, bean-like masses in the stool, concerning which there has been such difference of opinion, are curds which contain casein, and are formed in the stomach. The fact that they show no bile coloring matter in their interior goes to prove that they were moulded before they reached the duodenum where the bile is poured into the intestine. The additional fact that they disappear when the food is introduced by catheter directly into the duodenum and reappear when it is once more given by mouth, must be accepted as strong evidence toward this conclusion. Emphasis is placed upon the observation that certain infants are peculiar in their tendency to pass the curds with slight intermissions for months, whereas other infants similarly fed pass stools which are normal in this respect. This shows that in studying the pathogenesis of this condition, we must take a clinical as well as a laboratory point of view, and must consider the individual element and not merely the chemical factors which favor or hinder the coagulation of milk in the stomach. There are some infants who produce larger and firmer curds than do others, due either to the amount of rennin which they secrete, or to the abnormal condition under which the enzyme acts on the milk. These larger masses were found in the stomach and also in the duodenum of infants who passed casein curds in the stools. Ordinarily, the milk curd is pressed from the pyloric curd of the stomach into the duodenum in the form of slender, compact food-strings, which may be termed pyloric casts. In the case with curds in the stools, the catheter showed the duodenum to contain larger masses.

The curds are always of gastric origin and their pathogenesis is always gastric. The intestines play merely a secondary role. From the intestinal standpoint, the curds indicate merely the non-digestion of casein masses. The intestinal disturbance which at times accompanies the appearance of these masses in the stool, may be of gastric origin, or of the same origin as the disturbed gastric function; it is not caused by the curds, nor is it the cause of the curd formation. Although a healthy infant may thrive in spite of the curds, we cannot infer that they may not sometimes lead to more serious disturbance. Furthermore, it is open to question whether foreign bodies of this size should be allowed to form and to traverse the intestinal tract. Diluting milk with barley water does not check their formation, nor does pasteurization to 147° F. for forty-five minutes, a process which complies with the ordinances of the various cities. Pasteurization to 170° or 175° F. causes the curds to disappear to a large extent, and, therefore, may be said to render the milk more digestible in these cases. Hess believes

<sup>1</sup> American Journal of Diseases of Children, June, 1913.

that the curds should not be allowed to persist, but should be checked, either by a high degree of pasteurization or by boiling the milk.

An extended examination of the stools in cases of difficult digestion is recorded by Talbot,<sup>1</sup> of Boston. A rapid clinical method for the estimation of the total fat in infant's stools is described by Cowle and Hubbard,<sup>2</sup> of Ann Arbor.

**Breast-feeding.** Szerny<sup>3</sup> takes the ground, which will be accepted by most observers, that the breast-fed infant has a high immunity power. He believes that but few young children die directly as the result of faulty nourishment, and holds that the chemical composition of the food is but one element to be considered. Another important element is the putting of a child into a state to resist infection. There can be no question that, in this regard, breast milk is superior to any artificial food. In an extended article on the management of breast feeding, Erich Pritchard,<sup>4</sup> of London, also draws attention to the fact that certain effects of food can be recognized only by their physiological effects on the infant. The effect of the mother's nerves on the milk secretion is emphasized by Frost,<sup>5</sup> of Utica. This is a subject on which all careful observers are agreed, namely, that the nervous state of the mother may have more direct effect on the milk than her diet. The importance of wet-nursing of foundlings is emphasized by Estelle Lee,<sup>6</sup> of Philadelphia. This also is a subject upon which there is no difference of opinion among the physicians of foundling institutions. Go from institution to institution in New York City in the effort to secure an infant for adoption, and one will find the difficulty almost insurmountable of inducing the managers or physicians to allow a breast-fed baby to be adopted by a family which cannot continue to keep it nourished by a wet-nurse. Such an experience would be a valuable lesson to many a physician who is prone to thoughtlessly or unnecessarily put a baby on artificial food. The experts in these institutions have not reached their opposition to artificial feeding when breast-feeding is possible without long and bitter experience.

A remarkable case of aspiration of mother's milk is reported by Hjort.<sup>7</sup> The child was a young, healthy baby. Two hours after nursing there was considerable cyanosis which increased gradually while the respiration became difficult. Under artificial respiration and stimulants, the condition improved and the child slept, the cyanosis was less intense, but the condition became worse during the night and death followed a few hours later. Autopsy revealed the presence of milk in the lower air passages.

\* Archives of Pediatrics, April, 1913.

<sup>2</sup> American Journal of Diseases of Children, September, 1913.

<sup>3</sup> Medizinische Klinik, June 8, 1913.

<sup>4</sup> Archives of Pediatrics, March, 1913.

<sup>5</sup> Ibid., August, 1913.

<sup>6</sup> Ibid., July, 1913.

<sup>7</sup> Norsk Magazin for Laegevidenskaben, February, 1913.

After a very careful study upon the ability of mothers to nurse their children, J. P. Crozer Griffith<sup>1</sup> holds that the numerous stated contra-indications to nursing are more fancied than real. Actual contra-indications are few, and physicians should learn to appreciate this fact. The obstetrician who is thoroughly grounded in the importance of breast-feeding can be of the greatest aid, since he is so early associated with the mother and can exert a great influence on her. Many obstetricians in the past have paid all attention to the mother, but far too little to the infant. There is, and there can be, no good substitute for mother's milk and this the obstetrician should impress on the mother with all his power. It must never be forgotten that inability on the part of the mother to nurse, or inability on the part of the child to digest its mother's milk can never be determined by a brief trial. It is only after prolonged, repeated, and again repeated efforts that we can conclude that weaning is necessary. Here the fault often lies with physicians, since they are, as a rule, far too ready to abandon their efforts. Many a time a breast, which at first gives insufficient milk, will later render an ample supply, and the infant's digestion, at first much disturbed, will accustom itself perfectly after a while.

Griffith reaches the very important conclusion that the mother's ability to nurse her infant, although lessened in the past, is no longer materially diminishing, provided the woman has been raised and continues under normal healthy conditions; that these conditions are improving in the upper classes and are not changing for the worse in the poorer; and that the infrequency of nursing depends largely upon the ignorance of the laity and the indifference of physicians. It is our duty as physicians to remedy these conditions. Cameron<sup>2</sup> strongly combats the statement that modern women, far removed from the primitive conditions of life, suffer from any degeneration of the mammary gland. He holds that there is no proof that racial development is in the direction of atrophy of the gland or degeneration of its functions.

**Milk an Infant Food.** Numerous articles have appeared during the past year on heated and superheated milk. One of the best of these was that of Coit,<sup>3</sup> of Newark. During twenty-five years and with an experience of thousands of feeding cases, he has been an advocate of raw milk in the feeding of infants, when it is ideally clean and pure. He now says that in many cases where such milk cannot be obtained, he has come to the use of high degrees of heat and has been compelled to believe that the heating of milk is not the menace to its nutritive value that champions of raw milk would have us believe. He quotes largely from Lane-Claypon whose investigations have been published by authority of the Chief Medical Officer of Great Britain. In summarizing the results on some of the lower animals, he is led to the conclusion

<sup>1</sup> Journal of the American Medical Association, November 23, 1913.

<sup>2</sup> Lancet, September 27, 1913.

<sup>3</sup> Archives of Pediatrics, February, 1913.



that there is no evidence to show that boiled cow's milk is markedly inferior to raw cow's milk as a food for young calves. If young animals are fed on the milk of a suitable foreign species, they appear to thrive somewhat better if the milk is given boiled than if given raw, the only exception being in the case of germ-free milk. In those cases in which the health of the animals was inquired into, after the cessation of the experiment, no difference could be detected in the animals fed by different methods of artificial feeding. All the animals fed by different methods of artificial feeding were inferior to the breast-fed animals, both at the time of the experiments and afterward.

Coit further believes that there is apparently no serious loss of nutritive value produced by feeding an animal on boiled milk derived from an animal of the same species. At the same time it must be pointed out that the evidence published on this point is scanty. When an animal is fed on the milk of another species, such small difference as have been found in the nutritive values of raw and boiled milk, have been in favor of boiled milk. Milk of the same species has a considerably higher nutritive value for the species than the milk of any other species so far as investigated.

The evidence dealt with throughout this report emphasizes very forcibly the importance of breast-feeding for the young of all species, and shows the especial importance of breast feeding during the early weeks of life. When artificial feeding has been employed in animal experiments, boiled milk of a foreign species has given more satisfactory results than similar milk raw. Certain Berlin figures dealing with infants fed on boiled cow's milk, give extremely favorable results, and, in view of the evidence collected in this report, could scarcely be expected to be surpassed had raw cows' milk been used.

Another extended article on boiled milk *versus* raw milk is contributed by Brennemann,<sup>1</sup> of Chicago. He reports numerous experiments of his own, and quotes largely from literature. In reviewing the effect of boiling upon milk, he asserts that it changes practically every constituent of milk and many of its properties. Czerny enumerates eleven changes and yet advocates its use, as does nearly every French and German pediatrician. While this method of studying the subject is not of great value, nevertheless, we must admit that there is not one particle of evidence that babies in general do less well on boiled than on raw milk.

Scurvy, that rare, easily recognized, and promptly curable condition, is probably and undeservedly more responsible than anything else for the present strong prejudice against heating milk. The fact that scurvy is associated with the prolonged use of a dead food, has led us to blame all dead foods, without careful discrimination as to the nature of the food in other respects. The German and French writers do not

<sup>1</sup> Journal of American Medical Association, February 22, 1913.

consider boiled milk an important factor, but rather preserved and canned goods, or milk boiled for a long time, and even treat scurvy with milk that has been boiled for a short time. There is, moreover, so much evidence that scurvy occurs only in infants with a certain predisposition to the disease that this may be indeed the important factor. The fact that boiled milk is not so important a factor in the etiology of scurvy as are other things, is shown strikingly in the fact that scurvy is, if anything, less prevalent in Germany, and much less in France, than with us. While this may be due in part, or wholly, to the alarming popularity in this country of condensed or evaporated milk infant foods, nevertheless the French writers are unanimous in saying that they do not see scurvy in infants fed on boiled milk.

In concluding his paper, Brennemann asserts that he does not advocate the use of boiled milk or raw milk as a routine measure, but believes that each has indications. He holds that raw milk and boiled milk are clinically very different foods; that the most striking difference between them, as shown experimentally, is in their reaction to rennin, that the casein of raw milk, unless so modified that it will not form large and hard coagula, offers serious difficulties in digestion that are not present in boiled milk; and, lastly, that these differences between raw and boiled milk should always be borne in mind in comparing clinical, therapeutic, and experimental results in infant feeding.

Morse<sup>2</sup> also writes upon the subject of degrees of heat, in preparing milk for infants' use. He describes in detail the physical and chemical changes which take place, but is much less positive in his conclusions than are several other recent writers. He holds that the evidence at present available is insufficient to show whether cooked milk is less digestible than raw milk; whether babies thrive on it as well as on raw milk; and whether or not it predisposes to the development of the diseases of nutrition. Granting that the cooking of milk does make it somewhat indigestible and that its continued use does predispose to the diseases of nutrition, it is evident, nevertheless, that the disturbances which it causes are slight and insignificant in comparison with the diseases caused by milk contaminated with bacteria. All milk, except the cleanest, should therefore be cooked before being used as a food for infants.

The same author<sup>2</sup> advises the pasteurization of all but the cleanest and most reliable milk. He finds that there is no unanimity of opinion among the leading pediatricians of this country as to the effect of pasteurization of milk on its digestibility and as to whether it renders it less suitable for the feeding of infants. The difference of opinion being so great, it is, of course, impossible to draw any definite conclusions from them. The only conclusions that seem to be warranted from

<sup>2</sup> *Journal of American Medical Association*, March 22, 1913.

<sup>3</sup> *Boston Medical and Surgical Journal*, October 19, 1912.

Morse's study of the subject are as follows: It is impossible to determine, from the evidence at present available, whether or not babies fed continuously on pasteurized milk thrive as well as those fed on raw milk; or whether or not the continuous use of pasteurized milk predisposes to the development of diseases of nutrition. There is sufficient evidence to show, however, that if the continuous use of pasteurized milk is injurious to babies, its possibilities of harm are much less than those of bacteria. All but the cleanest milk should, therefore, be pasteurized before it is given to infants. There is, on the other hand, sufficient doubt as to the innocuousness of pasteurized milk to justify the avoidance of pasteurization whenever the character of the milk warrants it.

Knowledge of the whole matter is incomplete and unsatisfactory. The question as to the effect of the pasteurization of milk on the nutrition of infants can only be settled by a much more careful and extensive study of the whole subject, both in the laboratory and clinic, than has hitherto been undertaken. Morse urges that it should never be forgotten that the pasteurization of milk does not do away with the necessity of taking care of it and keeping it cold. It is just as important to keep pasteurized milk cold as it is to keep raw milk cold, because pasteurization simply diminishes the number of microorganisms. It does not destroy them entirely.

In an editorial article on the same subject,<sup>1</sup> special stress is laid on the importance of rapid cooling of the milk following heating. This is a detail too often neglected and its oversight may result in a dangerous food. In order to determine the best way of pasteurizing milk so as to kill the disease germs, and yet not give the milk a cooked flavor and lessen its nutritive value, the Department of Agriculture, through its dairy division, has been conducting a series of experiments, treating milk at different temperatures and for different lengths of time. According to the report of these experiments (Bulletin 166, Bureau of Animal Industry), when milk is pasteurized at 145° F. for thirty minutes, the chemical changes are so slight that it is unlikely that the protein or the phosphates of lime and magnesia are rendered less digestible than they are in the raw milk. Moreover, from a bacteriological standpoint, pasteurization at low temperatures is found to be more satisfactory than pasteurizing at high temperatures. According to Bulletins 126 and 161, where low temperatures are used, the majority of bacteria that survive are lactic acid organisms, which play an important part in the normal souring of milk. When milk is efficiently pasteurized at high temperatures, the bacteria which survive are largely of the putrefactive kinds, and milk so treated, if kept any length of time, has a tendency to rot instead of sour.

<sup>1</sup> Journal of the American Medical Association, May 10, 1913.



The cell content of milk has been the subject of careful study by Lewis,<sup>1</sup> of New Haven, who concludes that clumped polymorphonuclear and eosinophilic leukocytes, in whatever numbers accompanied by long-chain streptococci, mean cow troubles. Absence of streptococci does not mean that they will not be found when the original source of trouble is located. A differential blood stain is most important and essential. The Doane-Buckley volumetric method, scientifically accurate for cell-counts, is inferior to less accurate but differential count. Laboratories setting any standard for a pus-cell content as meaning cow troubles will frequently miss opportunities for preventing further infections.

The cellular elements of milk is also the subject of editorial consideration.<sup>2</sup> From a survey of the entire situation, the conviction has been reached that the cellular elements found in milk, either normally or in ordinary catarrhal or interstitial nonsuppurative mastitis, are tissue cells, and that "pus cells," in the ordinary acceptance of the term, do not appear in milk under these conditions.

The factors effecting the composition of milk are discussed editorily.<sup>3</sup> The following table represents the most recent statistics available upon the average composition of the milk of different breeds of cows:

	Total solids Per cent.	Fat Per cent.	Protein Per cent.	Sugar Per cent.
Jersey . . . . .	14.70	5.14	3.80	5.04
Guernsey . . . . .	14.49	4.98	3.84	4.98
Ayrshire . . . . .	12.72	3.85	3.34	5.02
Holstein . . . . .	12.00	3.45	3.15	4.65
Shorthorn . . . . .	12.57	3.63	3.32	4.89

**Artificial Feeding.** Great diversity of opinion is still to be found upon the artificial feeding of children. Advances along certain directions are being made, but the subject is still in a chaotic and unsatisfactory state. One must agree with Love,<sup>4</sup> of Jacksonville, when he says: "It must be confessed that much which has been written upon the subject serves only to darken counsel." He adds that the physician who has a system of infant feeding which is yielding satisfactory results need be in no hurry to make a change. It is, however, necessary that the physician should at least understand the chemical composition of any food that he administers; that he should be able to alter the relative composition of the constituents to the physical condition of the child; that he should acquire such a familiarity with his system that he may be able correctly to interpret any phenomenon of digestion and adapt his system to the exigencies of the occasion. The physician that can

<sup>1</sup> American Journal of Diseases of Children, October, 1913.

<sup>2</sup> Journal of the American Medical Association, June 14, 1913.

<sup>3</sup> Ibid., March 8, 1913.

<sup>4</sup> Southern Medical Journal, July, 1913.

do this is following a system which cannot be improved until there is a clarification of the haze which now envelops us.

Eaton,<sup>1</sup> of Pittsburgh, also urges the study of the individual child. Babies are units influenced by heredity and environment, and our most important task is to find out just what, and just how much, is the most suitable for the given child. We are not necessarily striving to raise fat babies, but those that are well, and those that will remain thoroughly well, who will have a consistent normal growth, and the greatest resistance.

Each year some special element of food receives particular attention in the literature of feeding. This year more has been written upon *sugar* than upon any other element and opinions are extremely varied. Variott<sup>2</sup> reports the cessation of previously uncontrollable vomiting when highly sweetened condensed milk was given, and the return of the vomiting when milk containing less sugar was substituted. Nobecourt and Schrieber<sup>3</sup> used the albumin milk of Finkelstein without satisfactory results. They believe that the lack of sugar is injurious, and feel that it is illogical to remove the lactose of milk and replace it with cane sugar or malt sugar. Reitschel<sup>4</sup> observed that children on starvation diet for certain nutritional diseases had a markedly diminished tolerance for sugars when full diet was resumed. He concludes that the starvation diet so often used in digestive disorders of children may, in certain cases, result in harm.

The carbohydrates most commonly used in infant feeding are the disaccharids, lactose, and saccharose, together with starch and dextrin. Of these, Rulison,<sup>5</sup> of Albany, believes that maltose is the most assimilable and least liable to undergo fermentation, while lactose is much more easily fermentable. At present, maltose is becoming widely used. In the feeding of normal infants, it has not given him results superior to those obtained in feeding cane sugar, although he believes it to be a safer form of sugar to feed, following convalescence from dyspepsia, acute intoxication, and atrophy. The objections to its use are the laxative effect which it seems to have in certain cases, together with the fact that many infants seem to tire of it quickly and lose appetite. Cane sugar has invariably given him better results than lactose, and he believes that in the past the use of the latter has been based on theoretical considerations rather than any superiority in the results obtained.

On the other hand, Morse<sup>6</sup> believes that, under normal conditions, lactose is better than maltose in the feeding of infants, and that there

<sup>1</sup> Archives of Pediatrics, November, 1913.

<sup>2</sup> Bulletins de la Société de Péd., June, 1913.

<sup>3</sup> Zeits. für Kinderheilkunde, May, 1913.

<sup>4</sup> Archives of Pediatrics, October, 1913.

<sup>5</sup> New York Medical Journal, March 8, 1913.

<sup>6</sup> Ibid.

is no indication for the use of saccharose in place of these sugars. The reason for this belief is that lactose undergoes lactic acid fermentation, which is the normal one in the infant's intestine, more readily than the other sugars, and that it is more suitable for the development and maintenance of the normal infantile, intestinal flora than other sugars. It favors especially the development of *bacillus bifidus* which is normally the predominant organism in the large intestine. It is doubtful whether the so-called "sugar fever" really is caused by sugar. The fact that the assimilation limit of lactose is lower than that of maltose is of no importance, because this limit is at least three times as large as would ever be given in a properly modified milk. However, there is a kind of indigestion in infants which is due to the fermentation of milk sugar, and the dextrine-maltose mixtures are most useful in the treatment of that condition.

In the acute diarrheas due to bacterial infection, the sugar given should be determined by the nature of the infection. In the type caused by the gas bacillus and other organisms of that class, large amounts of sugar are contraindicated, maltose being more harmful than lactose because it undergoes butyric acid fermentation more readily. This form of diarrhea yields most rapidly to treatment with lactic acid bacilli. The food must contain a proper amount of lactose to form a medium for the development of the lactic acid organisms. In the type due to the dysentery bacillus and other organisms which produce toxic substances from protein, on the other hand, sugars are indicated, because, when there is an excess of readily fermentable carbohydrates in the food, the bacterial activity changes from the proteolytic to the fermentative type. Lactose is preferable to maltose for this purpose, chiefly because it is more slowly broken down and absorbed, and consequently exerts a more prolonged action.

It has been evident for some years, according to Morse, that the conception that young babies are unable to digest starch, was erroneous. The last doubt has been removed by Hess' demonstration of the presence of a starch-splitting enzyme in the duodenum of the newborn. He sees no reason why it should not be given to any infant no matter what its age, if indicated. He does not believe in the routine addition of starch to the infant's food, and does believe that the amount added should be calculated in percentages. Starch should rarely be added in the early months for its food value, but chiefly for its mechanical or colloidal action in the prevention of the formation of hard casein curds.

After an extended review of the literature of the comparative value of sugars in feeding, and a report of certain cases, Haskell,<sup>1</sup> of New York, concludes somewhat indefinitely that the evidence presented has no bearing on the selection of a sugar for feeding "normal" infants. There

<sup>1</sup> Archives of Pediatrics, August, 1913.



is nothing in the literature to prove nor any observation in support of the contention that the maltose-dextrine mixtures are superior to lactose for addition to the food of the average sound infant. That malt-soup extract is superior to lactose, and the latter in turn preferable to dextri-maltose in some cases, seems indicated by his results, but the small number of cases and the limited time of observation makes him hesitate to draw positive conclusions.

Because of the difficulty of properly preparing the Eiweissmilch, of Finkelstein, and its expense, Hein and John<sup>1</sup> have advised a mixture which they call a "casein-fat milk." It is prepared by adding two teaspoonfuls of extract of rennet to two-thirds of a liter of cows' milk and heating it in hot water to 40° C. The coagulated milk is stirred up and poured into a fine sieve, and the whey allowed to drain off. Two-thirds of a liter of hot water is added to the coagulated part and it is rubbed through the sieve. The process is repeated until the fluid has the consistency of milk and runs through the sieve without rubbing. It is then heated to not over 88° C., being stirred continuously to avoid coagulation of the casein. After heating, one-third liter of cow's milk, which has been heated, and 30 gm. Soxhlet's sugar is added, and it is kept in the refrigerator until wanted. It has the advantage over albumen milk or protein milk of being cheaper, and it can be prepared at home by mothers of ordinary intelligence.

The wisest remarks of the year upon the so-called caloric feeding are of those of Morse,<sup>2</sup> who holds that it is irrational to speak of a system of caloric feeding as it is to speak of a system of percentage feeding. Babies cannot be fed calories; they must be fed food which they can digest and utilize. He does not believe, therefore, in using calories as the basis of an infant's food. The estimation of the caloric value of an infant's food, however, is of great importance. The food should be prepared to meet the indications of the individual case, and the caloric value then estimated to determine whether the caloric needs are being met or not. In this way both underfeeding and overfeeding can be avoided. That is, the estimation of the caloric value serves as a check. It prevents us from starving a baby in our efforts to get a food to fit its digestive capacity, and from grossly overfeeding it in our efforts to make it gain. It must be remembered, however, that babies do not all require the same number of calories for each unit of weight. One baby will thrive on a quotient on which another baby will starve, while another will starve on a quotient which will cause digestive disturbances in a fourth. Here, as always in infant feeding, the baby, not rules, must be followed. When intelligently applied, the estimation of the caloric value of food is of great assistance.

<sup>1</sup> *Monats. für Kinderheilkunde*, April, 1913; *Journal of American Medical Association*, May 31, 1913.

<sup>2</sup> *New York Medical Journal*, March, 1913.

In speaking of the ammoniacal odor sometimes present in the stools of infants, Southworth<sup>1</sup> believes that the condition, if persistent, points to a definite disturbance of metabolism. Furthermore, this ammoniacal odor may be regarded somewhat as an index to the disturbance, since it tends to disappear when the food has been adjusted so as to allow of more perfect metabolism. The fat of cows' milk seems to be the more frequent offender when given in excess of the normal capacity, or in cases of fat intolerance when given in excess of the individual's capacity.

<sup>1</sup> Archives of Pediatrics, October, 1913.





# RHINOLOGY AND LARYNGOLOGY.

BY GEORGE B. WOOD, M.D.

THE chief impression that one receives in going over the published nose and throat work of the past year is one of progressiveness. The development of technique, the application of scientific medical data, and a sincere tendency to progressive conservatism are all characteristic of this literature. There has been an apparent desire to withdraw from the more radical procedures and to aim at the best permanent result and the preservation of function.

## ANESTHESIA.

The tendency to give up the use of chloroform for operations on the nose and throat is shown in an article by Sommerville Hastings,<sup>1</sup> who, because of a certain definite number of cases which had given rise to considerable anxiety during operations, has transferred his allegiance from chloroform to *ether*. He uses the mouth insufflation method, and, if the operation lasts more than ten or fifteen minutes, warms the ether. Also, he adopts a procedure which imitates the anoci of Crile, in that when operating under general anesthesia on the nose, he cocainizes locally with adrenalin and 20 per cent. solution of cocaine hydrochloride.

Thomas R. French<sup>2</sup> has developed a technique which also utilizes certain of the anoci principles. He prefers to operate with the patient in a sitting posture, but, in order to make it as little a burden to the patient as possible, he has invented a chair which is a mechanical triumph. By levers and screws, a patient etherized in the recumbent position can be rapidly and smoothly placed in any position from the Trendelenburg to the sitting posture, without jarring or injuring the patient in any way. He pleads for the use of essence of orange in connection with ether anesthesia, and prefers the upright position, claiming a much less loss of blood and a smaller quantity of ether being required. The amount of shock and blood lost can be lessened by the sequestration of the limbs. He says that the amount of blood lost is distinctly lessened when sequestration is applied, even when the legs only are eliminated.

<sup>1</sup> Lancet, September 20, 1913, p. 864.

<sup>2</sup> New York Medical Journal, 1913, vol. xcvii, No. 1, p. 1061.

Robinson and Crawford<sup>1</sup> prefers the *nasotracheal anesthesia* for operations on the mouth, tonsils, etc. A hollow-tipped intratracheal catheter is guided into the larynx by a steel stilette introduced through the mouth; this, of course, being done after the patient has been etherized. The free end of the tube is then brought into the nasopharynx and out the nose by being fastened to another catheter which had been passed into the pharynx through one of the nostrils. Recognizing the advantages of intratracheal anesthesia, it would seem that this method of anesthesia is almost ideal, and yet it will probably not be universally adopted, chiefly because of the amount of time required to introduce the catheter and bring it out of the nose. The author, however, claims that it requires only five minutes, on the average, to introduce the nasal-tracheal tube, and in a series of tonsillectomies they say there has been no instance of the slightest indication of irritation or trauma to the larynx or trachea. Another disadvantage of the method is that during tonsil operations there is almost always an associated operation on the adenoid required, and the tube in the nasopharynx would interfere with the proper instrumentation.

### EXTERNAL NOSE.

While many interesting operations and appliances have been devised for the correction of the external deformities of the nose it seems well to recall at this time the simple, though radical, procedure of Dr. George Morley Marshall.<sup>2</sup> He has up to this time operated upon about 35 cases, and in the present article goes into detail concerning the technique of the operation. The essential feature of the operation is the cutting of the nasal process of the superior maxillary bone. An incision is made about one-quarter of a centimeter in length over the nasal process of the superior maxilla at a point where the elevation which makes the nasal prominence begins. Through this incision a chisel is introduced and made to cut through the nasal process, avoiding injury to the nasal cavities and nasolacrimal duct. Without enlarging the skin incision, the chisel may cut the bone as far as desired. Pressure is then made upon the wound by an assistant, while the operator proceeds with the other side. The nasal bone is then mobilized with a long-handled, broad-bladed forceps, one blade of which has been introduced into the nostril. After both sides have been loosened, if there is any nasal obstruction due to malposition of the septum, the septum is seized with forceps and forced into the correct position. If there is any deformity at the suture between the frontal and upper extremity of the nasal bones, this should be corrected by a sharp stroke with a mallet guarded by

<sup>1</sup> Clifton Medical Bulletin, July, 1913, p. 39.

<sup>2</sup> Journal of American Medical Association, January 18, 1913, p. 179.

a covered lead plate. The force should be directed downward from the frontal bone. After the operation, the nose should remain absolutely straight without being held. If, during the next day or two, there is any tendency for the nose to resume its former position, the patient should be taught to make proper pressure to keep it in a straight line.

An interesting case of rhinoplasty is recorded by W. W. Carter.<sup>1</sup> In this case the nose was completely absent, there being only a hole in the face where this organ should have been. He resected three inches of the ninth right rib, split it and scraped away the cancellous tissue from the outer half. This was transplanted between the superficial and deep fasciæ over the biceps on the left arm. Ten days later, after the bone had thoroughly incorporated into the tissues, a flap was raised, including the bone, and the upper end was sutured into the proper position on the face. Thirteen days later the flap was separated from the arm, but it immediately became white and cold, and later bluish. The interesting part of this operation is that at this time when the flap was about to die, he placed upon it a leech and the suction of this leech produced a strong flow of blood through the recently formed capillaries at the connection of the flap with the face and immediately the flap became warm and of good color and remained so. Several other minor operations were required to make the nostrils and shape up the flap.

A rather interesting method of correcting the depression of the external nose is that suggested by Otto Glogau.<sup>2</sup> He uses a portion of the cartilage resected from the nasal septum. In removing the cartilage, the mucous membrane was left attached on one side and, just before its insertion, the mucosa was carefully removed, leaving the perichondrium in place. A pocket was then made over the dorsum of the nose, through a transverse incision. The cartilage of the tip of the nose was curetted, and the resected portion of the septum shaped to fit in the cavity. After insertion of the septum cartilage, the wound was closed, and, in spite of the fact that the wound became infected, the cartilage retained its vitality.

### NASAL FOSSÆ.

A method for determining the influence of the nose on the temperature of the inspired air is described by A. Brown Kelly.<sup>3</sup> His latent instrument consists of two thermometers arranged side by side, the bulbs being bent up at an angle for the introduction into the nasal pharynx. When in position, the bulb of each thermometer is opposite, or just back

<sup>1</sup> Journal of the American Medical Association, March 8, 1913, p. 728.

<sup>2</sup> New York Medical Journal, November 9, 1913, p. 956.

<sup>3</sup> Journal of Laryngology, Rhinology, and Otology, 1913, vol. xxviii, p. 515.



of, the corresponding choana. The thermometers used were extremely sensitive so that the mercury responded immediately to the slightest rise or fall in temperature. There are numerous charts showing the changes in temperature under different conditions of the nose. He enumerates, in conclusion, some of the more important conditions which influence the temperature of the respiratory current in the nasopharynx. There appears to be individual differences and of course the temperature of the nasopharynx is influenced by the temperature of the external air. The depth of the respiration increases the amplitude of the excursions of the mercury, both in an upward and downward direction, but chiefly downward. With collapse of the inferior turbinate and widening of the inferior meatus, there is a fall in the temperature of both the inspiratory and expiratory stream, but especially of the inspiratory. When the inferior meatus is obstructed, but the upper part of the nose is free, the temperature rises above the normal, and when the middle meatus is obstructed, but the inferior is free, the temperature is generally below the normal. He found that the temperature is lower in the middle of the nasopharynx near the septum, also, near a level with the floor of the nose. When the nasal fossæ are unequal, the temperature behind the wide chamber is below normal, while that on the narrow side is at, or usually above, normal. It is interesting to have a scientific demonstration of these facts, though one must admit that the ordinary process of reasoning would suggest very similar ideas. It proves, however, the importance of the nasal structure as an actively functioning organ, and the necessity of avoiding mutilation or destruction of the turbinate bodies in operations inside of the nose.

**Bacteriology of the Nasal Fossæ.** An important addition to our knowledge of the bacteriology of the upper respiratory tract has been given us by H. Streit.<sup>1</sup> This elaborate and interesting series of bacteriological studies cover the flora of the mouth and nose, and represents the examination of more than two hundred different persons during the past two years. In one hundred and twenty of these persons both the nose and the throat were examined. In taking his cultures from the nasal fossæ, he found it absolutely essential to adopt some method which would avoid contamination from the vestibule. For this purpose he uses a long, large ear-speculum which was passed through the vestibule up and beyond the anterior end of the inferior turbinal. He found that, in 30 per cent. of normal cases, the nasal fossæ were absolutely sterile, 40 per cent. almost so, and that only 25 to 30 per cent. showed any great number of bacteria. The most frequent micro-organism found in the normal nose were the staphylococci. In a few cases he found pseudodiphtheria bacilli, and, among other organisms, a gram-negative diplococci. He frequently found that one side of the nose would be sterile and the other contain bacteria, and also that two

<sup>1</sup> Archiv für Laryngologie und Rhinologie, 1913, vol. xxvii, Heft 3, p. 393.

sides of the nose did not necessarily contain the same kind of bacteria. In contradistinction to his finding in the nose, his cultures show that the mouth and throat always contain a large number of bacteria. The most frequent microörganism found being the streptococcus, and next to this the staphylococcus. Neither in the nose nor throat did he find true diphtheria bacilli except when the patient was suffering from the disease.

He divided the streptococci into four groups: Group A, the hemolytic streptococci; group B, the streptococci mucosi; group C, streptococci which grew on blood agar, forming cultures with a well-marked greenish border; and group D, a collective group of anhemolytic streptococci. His most interesting results are those concerned with group A—the hemolytic streptococci. He found these organisms in the mouth cavity in about 30 per cent. of normal cases, while not once in a hundred examinations did he find them in the normal nose. The hemolytic streptococci were found greatly increased in tonsillitis. In 56 cases of tonsillitis and peritonsillar abscess, the hemolytic streptococci were present forty-nine times and in 2 cases its presence is doubtful, so that practically in ordinary tonsillitis the hemolytic streptococci is always present. In tonsillar inflammation these streptococci spread from the throat, so that he was able to find them in the nose in 13 per cent. of the cases of tonsillitis, and when present they gave rise to some form of irritation of the nasal mucous membrane. Worthy of notice were the results which he found following a series of thirty operations for the removal of hyperplasia of the inferior turbinal. The operation was done with scissors, and the nose packed with vioform or iodoform gauze. The packing was left in for two days, and only three times did he find the nose sterile. In the large majority, the infection does not come from the mouth but from the outside, though in a small number it is possible that mouth infection takes place. In 10 of these cases, he found the hemolytic streptococci in the nose following the operation, and, in seven of the 10 cases, there was a postoperative inflammation of the tonsils. Tonsillitis did not follow any cases in which the hemolytic streptococci were not found; also, after recovery from tonsillitis the hemolytic streptococci rapidly disappeared from the nose.

These results speak for themselves and need little comment. They bear out the careful work of some former observers, showing that the nasal fossæ are generally free from microörganisms, and that the more severe infections are generally due to the presence of the streptococci.

Though it is probable that the streptococcus is the active cause in the greater number of coryzas, we sometimes find that similar symptoms are produced by other bacteria of greater or less rarity. A. H. Mackintosh<sup>1</sup> reports a case in which he found a gram-negative bacillus resembling the "distemper" group of organisms. This bacillus was isolated

<sup>1</sup> The Lancet, December 14, 1912, p. 1647.

from a patient having symptoms of an acute febrile catarrh, as manifest by nasal obstruction, thin, watery discharge, sneezing, and watering of the eye. It was present in large numbers, and, according to the author, undoubtedly belonged to one of the groups classified by Hueppe, in 1886, and named the bacilli of hemorrhagic septicemia. When injected intravenously in small doses into guinea-pigs, this organism produced no obvious effect. Immunity, however, could be established with these small doses, so that a rabbit could receive the whole of the growth of a recent agar slant, suspended in 10 c.c. of broth, into one of the auricular veins. After an incubation period of sixteen hours, during which the rabbit was closely observed, the animal commenced sneezing and watering at the eyes. Smears of the copious discharge from the nose showed the bacillus present in large numbers, and pure cultures were easily obtained. In ten days the rabbit appeared quite well, and even in a postmortem no trace of the disease or organisms could be found. Rabbits injected with large initial doses rapidly succumbed to septicemia of the hemorrhagic type.

Ruth Tunnickliff<sup>1</sup> isolated an anaërobic organism, which she found almost always present in the early stages of acute rhinitis and yet in only one normal person were any found. This organism was a small bacillus, gram-negative, and staining only with carbol-gentian violet and carbol-fuchsin. She found that during the acute stage of rhinitis the opsonic index to this organism was low, rising as the infection subsided. A slight rhinitis has been produced in a human subject by pure cultures of this organism, and it could be re-obtained from the discharge. Also rhinitis was produced in a dog, but no organisms were found in the nose twenty-four hours after the inoculation. Before the etiological importance of this bacillus can be established, confirmation of the above finding must be had, and the author herself admits that further investigation is necessary.

Tunnickliff<sup>2</sup> has also isolated a spirochete from 5 cases of acute rhinitis. She could not, however, show that there was any importance to be attached to this organism so far as the pathology or etiology of the disease was concerned.

Leonard Hill and Francis Mueche<sup>3</sup> believe that acute rhinitis, apart from the general question of health and immunity, is due to a massive, direct transmission of bacteria from one person to another in a warm, confined atmosphere followed by exposure to cold. They have shown that, in a temperature of 80° F. or more, the nasal mucous membrane becomes flushed and swollen, turgid with blood and tissue lymph, and covered with a thick secretion; upon passing to a cold atmosphere, the mucous membrane becomes paler, owing to constriction of the bloodvessels, but still remains swollen with tissue lymph, as is shown by

<sup>1</sup> Journal of the American Medical Association, June 28, 1912, p. 2033.

<sup>2</sup> Ibid., June 7, 1913, p. 1781.

<sup>3</sup> The Lancet, May 10, 1913, p. 1291.



its appearance and by the fact that it pits deeply when touched with a probe. This condition, the authors claim, furnishes a proper soil for the reception of microorganisms. The liability to such infection could be lessened by keeping the air of rooms and crowded meeting places cool and moving. The motion of the air, by means of fans, will not only keep the mucous membranes in a better state but will also diminish the massiveness of the direct infection. The authors also found that convection heat, for example that from anthracite coal, flushes and swells the mucous membrane; while radiant heat, as that from a modern gas fire, causes sweating from the skin and does not affect the nose.

**Atrophic Rhinitis.** The etiology of atrophic rhinitis is still receiving its quota of attention from researchers and investigators. Gustave Hofer says that more than ten years have elapsed since Perez, of Buenos Ayres, called attention to the coccobacillus which he had cultivated from the nasal secretion of ozena patients. This bacterium took the usual aniline stains but was Gram-negative. It did not liquefy gelatin nor coagulate milk, but induced an ammoniacal fermentation in urine which then emitted the typical fetid odor of ozena. Little attention was first paid to the claims of Perez, but Hofer has recently carried out a rather extensive research to determine the specific action of this organism. At first he was not able to obtain a pure culture by the ordinary laboratory methods, but several times noticed that the cultures obtained gave off the peculiar ozena odor. Finally, by animal inoculation, he isolated a bacillus, which varied in size from a small coccus to a short, rod-like organism, and which in pure cultures, both fresh and those which had been kept for some time, had the peculiar smell. From fourteen patients he obtained 57 per cent. positive cultures, and in some of his failures he believed that the Perez bacillus was overwhelmed by the growth of other organisms, and this because some of the negative cultures at first gave off the typical odor which later disappeared. Rabbits were injected intravenously with both pure and contaminated cultures. They developed a purulent rhinitis, in the pus of which almost pure cultures of the bacillus could be found. Large doses of the organism were fatal. Small doses were followed by no acute symptoms, but, after about four days, a discharge began from the nose which in a few weeks led to atrophy of the turbinal tissues and general emaciation of the animal. Hofer further found that a sterile filtrate of Perez bacillus contained a soluble toxin. He says that it seems to be established beyond question that this bacillus can be found in the majority of cases of ozena and will induce in animals a nasal affection apparently identical with human ozena. He regards it as a great advance in our knowledge of ozena and also, as a help to treatment, because bacteriological examination permits an early diagnosis and may possibly lead to successful vaccine therapy.

This extremely interesting finding, confirming as it does the previous

work of Perez, ought to lead to further investigation, especially as these results would indicate that ozena is an infectious disease, a theory which is not generally accepted. On the other hand, A. A. Zografides<sup>1</sup> recalls the publications of Perez but does not believe that ozena is an infectious disease. Working with Schlaefrig, he carried out a number of experiments with the various microorganisms of atrophic rhinitis, and the results obtained make him doubtful as to the possibility of a specific organism. He believes, rather, that the atrophy of the nasal mucosa depends upon a trophic lesion of the trigeminal nerve. He calls attention to the fact that the mucous glands of the nose are influenced by the cerebrospinal and sympathetic nerve system. The cerebrospinal fibers come through the second branch of the trigeminal nerve, while the sympathetic fibers come from the sphenopalatine ganglion. Researches of Heidenheim and Asehbraund have shown that irritation of the trigeminal nerve will produce a watery secretion, while irritation of the sphenopalatine ganglion produces a small quantity of thick, slimy mucus. Zografides says, therefore, it seems likely that the drying of the nose is due to a trophoneurosis of the trigeminal nerve, and does not believe that Perez's coccobacillus has anything to do with it.

From my own experience, I would hesitate to accept the idea that atrophic rhinitis is a trophoneurosis. Its clinical features and pathology present a forcible picture of a chronic inflammation, such as would result from a slowly developing pyogenic microorganism. Further, the reasons advanced by Zografides for absolutely turning down Perez's work are not, to my mind, conclusive, and I should like to see further investigation carried out to settle the etiological importance of Perez's bacillus.

Zografides then goes into the *treatment of atrophic rhinitis*. He does not believe in the removal of the inferior turbinal or in other operative methods which increase the roominess of the nose. On the other hand, he holds that the chief object of the treatment should be to decrease the size of the nasal cavities, and to cause a mild superficial irritation of the nasal mucosa. He accomplishes this with a light glavano-cauterization not of sufficient severity to destroy the mucous membrane, the object of the irritation being to cause increased blood supply and increased secretion. The cautery knife should never be glowing hot, and the point should be as broad as possible so as to rapidly cover all of the surface of the mucous membrane, and an eschar should never be formed. The treatment required two or three minutes for each side and should be repeated every third day for a month. Generally after the first day the secretion becomes much more liquid, and the characteristic odor rapidly disappears.

Quite an exhaustive review has been published by Jonathan Wright<sup>2</sup>

<sup>1</sup> Monatsschrift für Ohrenheilkunde und Lar. Rhin., 1912, vol. xlv, p. 1497.

<sup>2</sup> The Laryngoscope, June, 1913, p. 641.

concerning the *association of accessory sinus discharge and atrophic rhinitis*. Wright says that, in certain cases, there is a chronic discharge from the posterior ethmoidal and sphenoidal sinuses which gives rise to crust formation, but that, in the majority of cases of atrophic rhinitis with ozena, the sinuses are not involved in any way, even in advanced cases. He also calls attention to the fact that atrophic rhinitis sometime exists only in one nostril when there is a bad deviation of the septum, and in this case straightening of the septum regularly cures the condition. Further, atrophic rhinitis not infrequently follows extensive operative destruction of intranasal structures. He summarizes the histological pathology, saying that owing to either antecedent inflammation, or to a constitutional dyscrasia, or to the pathological change of age, or to all three, there takes place a thickening of the perisoteum or perichondrium which is followed by malnutrition due to interference with the blood supply of the mucous membrane and the bone it covers. These changes are: (1) Metaplasia and cornification of the surface epithelium. (2) Round-cell infiltration. (3) Destruction of the blood-vessels. (4) Destruction of the glands. (5) Destruction of the elastic fibers. (6) Absorption of the bone, especially of the inferior turbinate. (7) Destruction of the smooth muscle fibers in the stroma. (8) The normal structures are, to some extent, replaced by round-cell infiltration, and by lowly organized fibrous connective tissue occasionally approaching the embryonic type. (9) While these changes are going on there is excretion or transudation to the surface of the lipoproteids derived from tissue waste and perverted gland function, which form a stinking, viscid secretion and crusts in which bacteria plentifully multiply. (10) Finally, this destructive metabolism ceases with the advent of old age, the foul secretions and crusts disappear, and the surface is moistened by a serous exudate which dilutes the remaining gland secretions sufficiently to secure its drainage. Thus nature brings about a cure difficult or impossible for man to accomplish.

F. P. Emerson<sup>1</sup> champions the *operative treatment for atrophic rhinitis*, believing that the essential part of the treatment should be the establishment of drainage from the sinuses. According to his experiences, the ethmoid and sphenoid sinuses together are most frequently involved: next in order come the combination of the ethmoid, sphenoid, and frontal; and last, ethmoid, sphenoid, and antrum. He says, further, that all causes of atrophic rhinitis should be treated as though they were cases of pansinusitis. He opens up the ethmoidal cells after the method of Mosher and then removes the anterior sphenoidal wall. The after-treatment is of great importance, and should be carried out carefully. He is opposed to the use of a watery spray of any kind. Though cases which show a temporary cure may be easily reinfected, they respond readily to local applications because the drainage from the sinuses is good.

<sup>1</sup> Annals of Otology, Rhinology, and Laryngology, 1913, vol. xxii, p. 333.



The idea which is suggested by reading Emerson's article, namely, that all patients suffering from atrophic rhinitis should undergo a radical operation on the ethmoidal and sphenoidal cells, seems to me lacking in the true conception of the clinical history and pathology of this disease. Wright's position is much more rational, namely, that those cases which are absolutely proved to be of accessory sinus origin should be treated as cases of accessory sinus disease, but that the large majority of cases of atrophic rhinitis having little or no involvement of the accessory sinuses should not be subjected to extensive operations.

The local treatment of atrophic rhinitis is generally very wearisome, and if there is truth in the claims of Louis Jackobs,<sup>1</sup> namely, that the use of *scarlet red* will give lasting benefit and that the treatment is of simple and short duration, it is well worth giving it a trial. His method is as follows: first, he cleanses the nose until it is free from all crust and discharge, and then applies, by means of a cotton applicator, a 5 per cent. suspension of scarlet red in either mucilage of acacia or of tragacanth. He found that this suspension remains adherent to the mucosa for about two days, so that at first the treatments should be made about every two or three days, the intervals gradually lengthening as the case progresses and becomes better. At times, he gives the patient a 1 per cent. solution in white petroleum to use at home.

**Hay Fever.** An interesting confirmation of Dunbar's work on hay fever is furnished by the work of Clowes.<sup>2</sup> He has found that patients suffering from the autumnal form of hay fever are sensitive to an aqueous extract of rag-weed pollen. There is a great variation in the dose required, some persons reacting from 0.05 c.c. of a solution 1 to 500,000, while others required 0.05 c.c. of a solution of 1 to 500. The strength of the solution required affords a fair index of the amount of immunity or resistance possessed by the individual. The reaction may be developed by abrading the skin and applying a drop of pollen extract, and is manifest by the formation of a large white welt similar to that resulting from a mosquito bite. The reaction develops within fifteen minutes and is not shown in normal persons. When larger doses are injected (1 c.c. of a 1 to 50,000 solution) considerable swelling and pain occurs, and small blisters resembling hives develop near the point of injection. A sense of general upset and dizziness follows, and a slight attack of hay fever may start up. Clowes made an attempt to immunize against the American autumnal hay fever by vaccination. For making the vaccine he used the method of Dunbar, which is that of repeated freezing, and thawing in a 5 per cent. aqueous suspension, and a method of his own consisting of precipitating the pollen with acetone and then extracting with water. While Clowes' series of observations is rather small, all the patients treated showed quite marked alleviation.

<sup>1</sup> New York Medical Journal, vol. xcvi, No. 1, p. 1143.

<sup>2</sup> Proc. Soc. Exper. Biol. and Med., 1913, p. 69.

A rather interesting method of treating hay fever and other forms of vasomotor rhinitis is that suggested by Alien.<sup>1</sup> During the past eighteen months Alien has had considerable success in the treatment of vasomotor rhinitis, including hay fever and nervous hydrorrhea, by the injection of a mixture of 80 per cent. *alcohol* and 1 per cent. *cocaine*. One gram of this solution is injected into the end of the turbinal, and only two or three injections are necessary before the patient shows distinct improvement. The patient experiences very little inconvenience, and there were no serious complications as the result. The turbinal sometimes remains swollen and pale for a few hours, or maybe two or three days. Gaudier has also had marked success with this method of treatment, having used it in some 18 cases, and in a few of his cases of hay fever a single injection gave very marked relief.

The scope of the injection of *alcohol for nerve blocking to relieve pain* has been broadened out by the work of Holmes.<sup>2</sup> About two years ago, stimulated by Sluder's work, Holmes began injecting the sphenopalatine fossa for the relief of severe neuralgia of the second branch of the trigeminal nerve. The injections were made under the guidance of a nasopharyngoscope. Holmes says that, in judging of the prospects for success, a great deal of help can be obtained by the application of a strong solution of cocaine over the area of the sphenopalatine ganglion. As a rule, the injections were harmless, but in one of his cases there was an alarming hemorrhage which began on the fifth day after the injection. The time of the relief from the pain, after the first injection, is generally only for a few days, but after the second it lasts for a few weeks, and after the third it may last for a few months or perhaps years. Before making the injection, the nose and nasal pharynx should be thoroughly cleansed. The lower meatus of the nose is then anesthetized with a 0.5 per cent. cocaine solution, and the nasopharyngoscope inserted into the side of the nose opposite to the ganglion to be injected. While the position of the ganglion varies somewhat, it is approximately beneath the mucous membrane just behind the posterior end of the middle turbinate. Two or three bloodvessels can generally be seen crossing this area, and apparently emerging from the sphenopalatine fossa. This area is next cocainized with a 40 per cent. solution. If this application is made during an attack of pain and if the pain ceases or is much relieved, the hope for relief or cure is much greater than when the cocaine has had no effect upon the symptoms. After the cocainization, a long needle, with a point covered, is pushed through the side of the nose on which the ganglion is situated which is to be treated, and then through the nasopharyngoscope the needle is inserted to the desired depth and a 5 per cent. carbolic-alcoholic solution injected. Holmes has never used more than six drops of the solution at one time.

<sup>1</sup> Review H. of Laryngologie, 1913, No. 4.

<sup>2</sup> Annals of Otology, Rhinology, and Laryngology, 1913, vol. xxii, p. 350.

Following the injection there is generally pain for a minute or two, this in time being followed by numbness in the face and palate, but sometimes there are no effects until after a few days. Holmes' experience covers 46 cases, and the number of injections for each case varied from 1 to 9. Because of his one experience with postoperative hemorrhage, he does not regard the procedure as harmless, but recommends it only for the treatment of severe cases. He admits that so far he has not had sufficient experience to give definite data concerning the permanent results, but says that it is certain that many cases can be relieved by the carbolic-alcoholic injection, and as the procedure is comparatively harmless, and as a rule a painless one, and can be repeated a number of times, it ought to be given a trial before the more serious operations are undertaken.

Sluder's last article<sup>1</sup> on the sphenopalatine ganglion reiterates his belief in the importance of his structure in the *etiology of certain neuralgias of the head and face*. The text of this present article is based on experience with 214 cases, involving three hundred and eleven injections, as well as experiments on the cadaver. He says that the position of the sphenopalatine ganglion, lying in the pterygomaxillary fossa, is in such intimate anatomical association with the neighboring nasal structure, such as the accessory sinuses or sometimes the nasal mucous membrane, that it may become involved in diseased process either by direct extension or by the transmission of toxins. Thus may be produced a symptom-complex, partly neuralgic and partly motor. The radius of the pain is very extensive, involving the root of the nose, eye, the upper jaw and teeth, backward under the zygoma to the ear and often very severe at a point of 5 cm. back of the mastoid process. The pain may extend thence to the occiput, neck, shoulder-blade, shoulder, breast, and, when severe, to the arm, forearm, hand and fingers, with sometimes a sense of sore throat on that side. Mild cases may have simply a sense of tension in the face and stiffness in the shoulders. The pain may be constant, cyclical, or recur irregularly. The motor changes are noticed in the soft palate, the arch being higher on the affected side, with the raphe and uvula being slightly deflected to the well side. Sluder says that he has never seen all the manifestations present in one case. The diagnosis of neuralgia originating in the sphenopalatine ganglion may be made by the cocainization of the sphenopalatine ganglion, which is done by application of a strong solution of cocaine just back of the posterior end of the inferior turbinal. If pain is relieved by this application, the trouble is in the sphenopalatine ganglion, as cocainization of this region does not in any degree stop pain created by the more central lesions of the nerve trunk. In the treatment of these cases, Sluder first attempts to allay the pain with cocaine, which in new cases is often curative, and then follows this by applications of formaldehyde or

<sup>1</sup> Journal of the American Medical Association, September 27, 1913, p. 1201.



silver nitrate. When this fails to give permanent relief, he injects the ganglion with 95 per cent. alcohol to which 5 per cent. phenol has been added. In making the injection, Sluder uses a straight needle 1 mm. in diameter and of considerable strength, and fastened to a heavy cross-bar, which enables the surgeon to grasp it more firmly. It is sometimes also modified by having a flange, or ring, 0.5 to 0.66 cm. from its point. The needle is entered through the nostril, carried over the inferior turbinal and is made to enter the mucous membrane of the lateral wall of the nose 2 mm. anterior to the posterior tip of the middle turbinate. Pushed back from this point for 0.66 cm. it strikes nearly the centre of the ganglion. When the needle enters, with only light pressure it is easy to estimate the proper distance, but should the needle meet with bone and have to be forced through, it should be withdrawn and reinstated before the injection is made. The second insertion is done because the entrance of the needle through the previously made hole is easy and requires no pressure. Occasionally a machine drill or burr has to be employed to make the opening. About 0.5 c.c. of the carbolyzed alcohol should be injected. Sluder says that his experience shows that this form of treatment is highly satisfactory in the large majority of cases. He reinjects when the result is insufficient, or when there is a recurrence of pain, always using a previous application of cocaine as described. If the pain should be aggravated by the cocaine, he does not inject the phenol alcohol.

**Nasal Septum.** Practically ever since the submucous operations for correction of the deformities of the nasal septum have come into vogue there has been a great deal of dispute as to whether a regeneration of the cartilage from the perichondrium left after the operation ever occurs. I have never seen any case in which regeneration of the cartilage could be clinically demonstrated, but this question is of such importance that the work of Ssamoylenko<sup>1</sup> is the most timely. He has carried out a series of experiments on the nasal septum of cats. His work shows with great clearness that the perichondrium left after the operation does not, even after twelve months, make any attempt to form new cartilage, but, on the other hand, it completely degenerates and gives rise to the formation of connective tissue. Very soon after the operation the old cartilage becomes slightly proliferated around its edges. This lasts for about six months and then gradually disappears, so that at the end of a year there is absolutely no growth. This proliferation is manifest by a bulb-like thickening on its free edge and will be better seen the sooner the observation is made after the operation. The author is at a loss to account for the cessation of growth of the cartilage but says that this period of activity followed by a retrogression is a condition which is probably responsible for the lack of agreement between different authors concerning the possibility of the reformation

<sup>1</sup> Zeitschrift für Rhinologie und ihre Grenzgebiete, 1913, vol. vi, Heft 1, p. 7.

of the septal cartilage. He, however, urges that the perichondrium be preserved as nearly perfect as possible, not with the hope that cartilage will reform but because of the fact that the perichondrium protects the glands of the mucous membrane against the invasion of scar tissue, which develops between the two layers of the perichondrium from between which the cartilage has been removed. The fundamental facts developed by his work are that, following the submucous resection of the cartilage of the nasal septum, the perichondrium proliferates connective tissue fibers and not cartilage tissue; second, that the old cartilage does not make any attempt to replace excised cartilage; third, that the wound between the layers of the perichondrium is filled with fibrous tissue and never with cartilage.

Samuel Iglauer<sup>1</sup> has experimentally shown the feasibility of transplanting the nasal tissues from one animal to another of the same species. The successful transplantings were always submucous, and, in his animal experiments, the tissues seem capable of growing in their new environment. On the other hand, his clinical material, while showing that such transplantations could be successfully done, also demonstrated that there was a distinct tendency for the transplant to become absorbed.

A question concerning the probability of serious meningeal or cerebral infection from accidental exposure of the dura of the anterior cerebral fossa, following operations, is one that has occupied a good deal of thought and is of extreme importance. The general impression seems to be that, when the dura is exposed in the roof of the nose or ethmoidal cells, a very serious accident has occurred, though a similar exposure of the dura following a mastoid operation is considered of very slight importance. It cannot be argued that in the nose we have an infected field while in the mastoid we have an aseptic, for frequently the mastoid process is the seat of severe infection and the dura flooded with pyrogenic organisms. I have seen the dura exposed in the roof of the nose, over an area of one inch long by one-half inch wide, following the removal of a syphilitic sequestrum without even inconvenience to the patient.

Bearing directly on this point are 2 cases reported by James B. Horgan.<sup>2</sup> The first case occurred while operating on the ethmoid labyrinth, and the exposure of the dura was announced by sudden, severe pain. Upon careful inspection, the dura could be seen pulsating through the opening made by the removal of an ethmoid cell. The patient made an absolutely uninterrupted recovery, and never showed the slightest sign of intracranial irritation. The second case occurred during a submucous reaction of the nasal septum, which was done for the relief of severe headaches. The author had, by a twisting motion, broken away a portion of the perpendicular plate of the ethmoid across

<sup>1</sup> *Annals of Otology, Rhinology, and Laryngology*, 1913, vol. xxii, p. 308.

<sup>2</sup> *Journal of Laryngology, Rhinology, and Otology*, 1912, vol. xxvii, p. 652.

the top of which a part of the cribriform was found to be attached. Upon separating the flaps with a Killian speculum, the author saw that the dura had been exposed for about one-half of an inch in width. This patient also made an uninterrupted recovery, and showed no ill effects from the operation.

The use of the mica plate for the prevention of nasal synechiæ as proposed by E. J. Moure<sup>1</sup> has certain advantages in the treatment of rebellious synechiæ. These advantages are, that the scales can be made as thin as desirable, are easily sterilized, and as they are very flexible, can be introduced curled up and permitted to open out in the nose. They are non-irritable and can apparently be left in the nose as long as is required for cicatrization to take place.

From time to time various intranasal operations have been described for overcoming stenosis of the nasolacrimal duct. Yankhauer<sup>2</sup> called attention to a very important objection to those operations, which simply establish a fistula between the lacrimal sinuses and the interior of the nose, namely, that when the patient blows his nose, air, mucus, and various foreign substances may be blown into the eye. To overcome this objection, he suggests the following procedure. The operation has for its purpose the formation of a new canal, the internal wall of which consists only of the nasal mucous membrane. The operation is done under local anesthesia. An incision is begun at the anterior end of the middle turbinate and carried forward 0.5 cm., then downward to the anterior end of the lower turbinate, and then backward along the extreme edge of the inferior turbinate for 2 cm. The flap thus outlined is elevated. As the lower half of the lower turbinate bone is very rough, a sharp elevator is required, and occasionally a pair of scissors necessary to cut the prolongations of the periosteum which extend into the deep pits on the surface of the bone. When it is loose, the flap is turned backward, being tucked up under the middle turbinate. The mucoperiosteum is now elevated from the outer or lower surface of the inferior turbinate, and the bone removed for its anterior third. In order to find the opening of the canal, a probe should be moved from behind forward, so that it will pass under the folds of Hasner and enter the canal. When the nasal orifice in the membranous canal cannot be found, the canal itself may be anesthetized by plunging a hypodermic needle, bent at right angles, through its wall at the nasal orifice of the bony duct. The precise localization of the nasal orifice of the bony duct is necessary, as the removal of the inner wall of the duct is begun at this point. Beginning at this orifice by the use of a specially constructed forceps, which has a small but stout jaw turned upward nearly at right angles to the shank, the overhang of the lip of the orifice is cut through after the membranous canal has been sep-

<sup>1</sup> *Annals of Otolaryngology, Rhinology, and Laryngology*, 1912, vol. xxi, p. 1021.

<sup>2</sup> *The Laryngoscope*, December, 1912, vol. xxii, p. 1331.



arated by means of a right-angle probe. The anterior edge of the nasal orifice is now removed very carefully with a gouge bevelled from the inside. As soon as the membranous canal has been clearly brought to view, the inner wall of the duct is rapidly removed with the forceps, and then the anterior wall is attacked with a chisel. The enlargement of the orbital orifice can be best accomplished with the guarded chisel devised by the writer for enlargement of the frontonasal duct. The membranous duct is now slit up as far back on its inner wall as possible. The contents are removed, and the part of the duct in front of the incision is brought forward and laid against the bone. The mucous membrane flap from the outer wall is now turned forward and returned to its original position. When there is pus in the lacrimal sac, an opening is made through the mucoperiosteal flap opposite the sac for drainage purposes. This opening closes spontaneously when the discharge stops. The author has operated upon 9 cases according to this method and the suppuration was stopped in all of them, and the epiphora was relieved in all but one.

J. M. West<sup>1</sup> proposes a somewhat different method. He cuts off a small piece from the nasal process of the superior maxillary bone and from the lacrimal bone, doing the work through the nose until the side of the sac toward the nose is exposed. This is then cut away and ample communication is provided from the eye to the nose above the inferior turbinate. In over 100 cases, the suppuration promptly healed in 90 per cent.

**The Endonasal Method of Approach to the Sella Turcica** for the removal of tumors of the hypophysis has acquired considerable vogue, especially among rhinologists, and during the past year the literature on the subject has been enriched by the report of a comparatively large number of cases operated upon by this method. Hirsch,<sup>2</sup> in an extended monograph, reviews the results of twenty-six operations for tumor of the hypophysis, all done by the endonasal method. Of the various routes through the nose, he prefers the one consequent upon a submucous resection of the septum. He says that the operation can be completed in one sitting, and that the danger of infection is much less than when operating through the nasal cavities themselves.

The patient is prepared for the operation by the administration of one gram of urotropin three times a day, for a day or so before the operation. The administration of urotropin is to be kept up for a week after the operation, or may be continued indefinitely if so desired. He always operated with the patient in a sitting posture and under local anesthesia. The nasal septum is resected according to the method of Killian. After the septum has been removed, the mucoperiosteum is elevated from the anterior surface of the sphenoid bone in both lateral directions until the

<sup>1</sup> Berl. Wochn. Chr., May 19, 1913.

<sup>2</sup> Archiv für Laryngologie und Rhinologie, 1912, vol. xxvi, Heft 3, p. 529.

openings of the sphenoid sinuses are reached. The anterior walls of both sinuses are then thoroughly removed, and the operation is stopped until bleeding can be controlled. The projecting wall of the sella turcica can now be seen, and is opened with a hypophysis chisel which should first make only a small fissure. Through this fissure a hook formed elevator is carried between the bone and the dura and on withdrawing this elevator, a small portion of this bone is broken away, leaving an opening. This opening is enlarged with a small pair of bone forceps, or, if necessary, with a chisel. The tumor is attacked with freshly sterilized instruments. A flap is turned down from the dura and the dural knife pushed into the tumor to determine whether or not it is cystic. If no cyst is present, the tumor should be removed with a sharp curette, great care being exercised when the curettement is sideways or upward. The greater amount of curetting should be in a downward direction. After the operation is finished, a small wick of iodoform gauze is placed between the septal walls to permit drainage from the sphenoid sinuses.

Of the 26 cases operated on by Hirsch, three died, though all of these were cases of large malignant tumors; three showed no improvement, 14 cases showed distinct improvement, and in a few the improvement was very marked. This article of Hirsch's is extremely elaborate, especially in regard to the individual reports of cases and for those especially interested in this work it is well worth reading in the original.

Of interest in connection with the submucous resection method of reaching the sella turcica is the report by Litwinowicz<sup>1</sup> of a case operated upon by him by this method. The patient died on the ninth day after the operation from diabetes, but the postmortem examination showed no evidences of any inflammatory changes in the meninges. It also showed that an important part of the tumor was held in the cranial cavity, outside of a very markedly dilated sella turcica. From this case, Litwinowicz recognizes that a large tumor, such as the one reported, cannot be removed by the intranasal method.

Jules Broeckaert<sup>2</sup> prefers the endonasal method of reaching the hypophysis in the large majority of cases, but is opposed to the submucous route. He believes that a much freer and better approach is afforded by the entire removal of the nasal septum. His method of operating is as follows: Following cocaine anesthesia, a small, double-edged knife is passed into the left nostril and the septum transfixes from one side to the other, between the columella and the anterior border of the quadrilateral cartilage. This transfixion begins close to the floor, and rises to the level of the insertion of the septum into the bridge of the nose.

<sup>1</sup> *Monatsschrift für Ohrenkeilkunde und Laryngo-Rhinologie*, 1913, vol. xlvii, p. 807.

<sup>2</sup> *Journal of Laryngology, Rhinology, and Otology*, vol. xxviii, No. 7, p. 340.

Then, while the assistant holds the columella aside, the septum is divided from before backward, a few millimeters above the floor of the nasal fossæ. This can be done with cutting forceps or with a narrow gouge. The quadrilateral cartilage is then divided from before backward in a line parallel with the bridge of the nose, but leaving a strip some millimeters in width. The removal of the perpendicular plate of the ethmoid is then continued either with both forceps or with chisel and mallet, following a line parallel with the cribriform plate of the ethmoid, and extending backward to the body of the sphenoid itself. The septum thus detached above, in front, and below, is grasped with strong tooth forceps and separated by rotary movements. Any remains of the posterior border of the septum, including the crest of the sphenoid and the superior angle of the vomer, are removed with cutting forceps. After bleeding has been stopped, a Killian's long speculum is passed into the left nostril and opened widely so as to crush the middle turbinals and the lateral masses of the ethmoids, which some times are in the way on each side. Any structures which obstruct the sphenoid sinuses must be removed. The opening of the sphenoid sinuses and the trephining of the sella turcica is now easily carried out between the blades of the speculum, which, however, must be held by the assistant exactly in the middle line. The inferior median crest of the sphenoid here serves an excellent guide line.

The chief advantages of this method over that of Hirsch, who does the submucous resection, is that the displacement outward of the columnar cartilage permits a straight, easy approach to the anterior wall of the sphenoid, and a great saving in time is afforded by the resection of the nasal septum when no attempt is made to preserve the mucous membranes. To operators who do not possess the manual dexterity of operating through the nostril, Broeckaert recommends a paramedian vertical rhinotomy. A strong pair of scissors, one blade of which is introduced into the left nostril, is made to cut through the skin and subjacent cartilage on the top of the nose upward as far as the nasal bone, and this incision is prolonged with a scalpel upward on the bone to the root of the nose. This flap is dissected off, freed from its bony attachments, and turned to one side. The orifice of entry may be enlarged by removing a part of the nasal bone and of the ascending process of the superior maxilla. The operation is then carried forward by the complete resection of the nasal septum and crushing any of the obstructing turbinals.

Another method of approaching the hypophysis, which Broeckaert believes will be valuable in certain cases, is the palatine route formerly proposed by Koenig. Briefly, the technique, worked out by Broeckaert on the cadaver, is as follows: The velum of the palate is divided in the median line forward to the osseous plate. The mucoperiosteum is then detached from the hard palate in two flaps and carefully loosened from



the posterior edge. These are held apart, and the horizontal plate of the palatal bone is removed with bone forceps. The posterior edge of the septum is cut away little by little with gouge forceps. By destroying the bifurcated edge of the vomer and the crest of the sphenoid, the sphenoidal sinus can be opened in the median line on its antero-inferior aspect. It is absolutely essential that, before the superior wall of the sinus is opened, all landmarks should carefully be determined under the control of artificial lights, and the sella turcica opened exactly in the median line. Broeckaert says he has not used this method actually on the living subjects, but is very much attracted by it and believes that, in certain cases, it may be very advantageously used.

### ACCESSORY NASAL SINUSES.

For the treatment of acute and subacute diseases of the accessory sinuses, especially when the ethmoidal cells are involved, Manning<sup>1</sup> suggests the use of *tamponades*. The tampons are made of cotton and saturated with argyrol, 40 grains to the ounce, and in most cases should be placed between the middle turbinal body and the septum. When drainage of the maxillary sinus is especially desired, they should be put under the middle turbinal. They can be made out of cotton formed on an applicator and then dipped in the argyrol solution. He believes that they deplete the proximate soft tissue and drain the ethmoidal cells and other sinuses by capillary attraction. They should remain in place for from twenty minutes to an hour, or until the patient begins to show evidences of irritation from their presence.

Though many of the claims of Manning cannot be substantiated, I have found that in acute rhinitis with involvement of the ethmoidal cells, the tampon with some mild silver solution, such as argyrol or the colloidal oxide of silver, seems for some reason to possess distinct value. In some cases, however, the irritation of the foreign body is evidently too severe for the inflamed mucous membrane, and produces quite a marked reaction.

**Frontal Sinuses.** A rather illuminating series of experiments concerning the possibility of obliterating the frontal sinus has been carried out by Ssamoylenko.<sup>2</sup> He operated on cats and dogs, and the results obtained are both striking and of extreme interest in that they give scientific data concerning the possibilities of obliterating the lumen of the frontal sinus. His article is accompanied by very convincing photographs. Briefly, his results are as follows: If the frontal sinus of an animal is opened and the mucosa curetted away, the sinus then dried with hot air and painted with tincture of iodine, the cavity of the

<sup>1</sup> Southern Medical Journal, 1913, vol. vi, p. 531.

<sup>2</sup> Archiv für Laryngologie und Rhinologie, 1913, vol. xxvii, Heft 1, p. 137.

sinus will become obliterated by the formation of new bone. In cats and dogs this requires about six months. In this operation, the opening into the sinus was made only large enough to permit a thorough curetting of the interior, being about 0.75 cm. in width. The examination of the sinuses operated on showed that the obliteration was due to the energetic vitality of the endostium and periosteum, which, very soon after the operation, gave rise to numerous osteoblasts and a large amount of connective tissue. Also, the bone aided in the obliteration process by the formation of new layers. The medulla of the bone plays no part in the obliteration. Ssamoylenko did not confirm these results on clinical material, but argues that as the anatomy of the endostium and periosteum in man is identical with that of animals, it seems reasonable that obliteration of the frontal sinuses can be accomplished in man just as it can in animals. Ssamoylenko recognizes that it is possible that disease of the bone may interfere with the new growth and obliteration of the cavities, nevertheless, he believes that the endeavor of the operator should be to thoroughly remove the mucous membrane, leaving the periosteum, and to so place the opening into the sinus as to produce the best cosmetic results. He further states that the sinus, when deprived of its epithelium, never becomes again covered with this structure, as the mucosa of the nose will not grow up into the frontal sinus.

These results obtained by Ssamoylenko are, of course, extremely interesting and instructive, but, as suggested by himself, it seems very possible that the elements of disease, which are always present in our clinical cases, will interfere with the formation of new bone. If we accept his statement that the epithelium of the nasal cavities will not grow into the frontal sinus, then the operation on frontal sinuses must either be for the purpose of curing a diseased mucosa by the restoration of normal drainage or it must attempt the obliteration of the sinus by encouraging the formation of new bone and connective tissue.

Adalbert Heindi<sup>1</sup> gives a rather timely warning when he says that before we proceed to do a radical operation on the frontal sinus, for suppurative disease of this cavity, we must be very careful to first prove the absence of syphilis. As an aid to our diagnosis he mentions the following characteristic symptoms of syphilis on the frontal regions: (1) A slow and gradually increasing headache, which is not entirely located in supraorbital region, but which spreads backward over the scalp and is of a dull, unbearable character. The pain increases toward evening and reaches its highest point of intensity during the night. (2) The symptoms of cerebral involvement appear early, and are manifest by a sense of confusion in the head, dizziness, and unwillingness to concentrate the mind, and general nervous unrest. (3) The periosteal

<sup>1</sup> Monatsschrift für Ohrenheilkunde und Laryngo-Rhinologie, 1913, vol. xlvii, Heft 2, p. 197.

or circumscribed ostitic swelling appears very early, and this swelling is characterized by a central softening and the imparting of a doughy sensation to the fingers. (4) The discharge from the nose is usually slight, rather bloody or of a greenish, caseous character. (5) Although there is relatively slight irritation of the eye and in many cases none at all, particularly of the conjunctiva or the ciliary body of the eye, edema of the upper lid appears early, and is not sensitive to pressure. (6) Fever is slight or not present, and there is immediate improvement in all symptoms following the administration of iodine.

**Maxillary Antrum.** Probably the most popular method of confirming the diagnosis of suppuration of the maxillary antrum is the washing out of the sinus through a puncture through the inferior meatus. The small amount of pain, the apparent insignificance of the procedure, and the positive results, makes this method of diagnosis very popular. However, the procedure is not always unaccompanied by unpleasant results. I have seen one case of severe hemorrhage following a simple puncture which necessitated careful packing, not only of the entire nasal fossæ, but also the insertion of a posterior nasal tampon, and another case of bleeding which was finally controlled by a tampon under the inferior turbinal.

H. M. Bowen<sup>1</sup> reports two cases of *air embolism, following simple puncture of the maxillary sinus* through the inferior meatus. In both of these cases, air was first forced through the cannula, but only with moderate pressure, and this procedure was a part of the routine which Bowen was accustomed to use. In both cases, there immediately developed convulsions and cyanosis. One case finally recovered after seven days, having gone through a very alarming illness. The other case died within a few minutes. At the postmortem examination an air embolism of the general circulation was found, so that the air escaped with a hissing sound when the pulmonary artery was opened and was followed by a collapse of a previously distended heart. No enlarged bloodvessels could be found near the antrum, but the mucosa had been detached from over the greater extent of the roof of the sinus, and Bowen believes that the air had entered the circulation by being forced between the mucosa and the bone opened up numerous capillaries.

Oswal Levinstein<sup>2</sup> objects to the usual methods of opening the maxillary sinus through the nose because they do not permit of a good view of the inside of the sinus nor of the complete removal of the mucosa. He says that Sturmman's method of cutting away the edge of the pyriform aperture and part of the wall of the maxillary sinus is the only intranasal method which permits a good view of the interior of the sinus, but this cutting away of the hard, thick bone is extremely painful for

<sup>1</sup> Annals of Otology, Rhinology, and Laryngology, 1913, vol. xxii, p. 180.

<sup>2</sup> Zeitschrift für Laryngologie, Rhinologie und ihre Grenzgebiete, 1913 vol. vi, Heft 3, p. 419.



the patient, and therefore should be avoided, if possible. Levinstein suggests the following technique for the intranasal operation:

After local anesthesia has been produced by the infiltration method, an incision is made through the mucous membrane over the free edge of the aperture-pyramidal down to the bone, and then is carried parallel with the anterior edge of the inferior turbinal until it reaches the middle of the nasal floor.

The mucoperiosteum is now elevated from the lateral wall of the nose beneath the inferior turbinal, and from the nasal floor until the middle of the inferior turbinal is reached. With a pair of scissors, the loose mucous membrane is cut as close as possible from its insertion on the inferior turbinal and reflected back against the septum. The bony wall can now be easily and distinctly seen, and is readily opened by means of trephine or chisel, and the opening enlarged to the desired size by bone forceps. It is important that the anterior portion of the medial wall of the maxillary sinus should be completely removed in order to procure a good view of the interior. All projections between the nasal floor and the cavity of the sinus must be smoothed down so that the mucoperiosteal flap can be properly adjusted. After careful curettement of the mucosa of the maxillary sinus, the flap of mucoperiosteum which was loosened from the floor of the inferior nasal meatus is placed in the opening into the maxillary sinus and tamponed for twenty-four hours.

The advantages which the author claims for this method are that a perfect oversight of the field of operation is permitted at all times; that the opening can be made of proper size and position; that all projecting corners and edges can be easily smoothed down; that the inferior turbinal is preserved without the necessity of a temporary resection; that the preservation of the pyramidal aperture and the faucial wall of the maxillary sinus avoids the most painful part of the operation; that one has a good view while curetting the antral mucosa, and, finally, that a flap of mucous membrane is formed which can be transplanted into the cavity of the antrum.

**Ethmoidal Cells.** Probably the most interesting article on the accessory sinuses published during the past year is that of Mosher<sup>1</sup> on the *intranasal surgery of the ethmoid*. As he gives, in a summarized form, the important points of the anatomy and operative surgery of the ethmoidal labyrinth, I take the privilege of quoting his summary verbatim.

"The anterior boundary of the ethmoidal labyrinth is made by the internal angular process of the frontal bone and the posterior surface of the ascending process of the superior maxilla. The labyrinth cannot be entered effectively unless the curette is carried outward behind the ascending process of the superior maxilla toward the lacrimal bone. Removing the anterior end of the middle turbinate and curetting

<sup>1</sup> The Laryngoscope, 1913, vol. xxiii, p. 881.

upward, and not outward, does not open the labyrinth to any extent. The internal angular process of the frontal bone makes two-thirds, or the whole, of the bony ring, which is the first part of the nasofrontal duct. The best guide to the duct is the posterior surface of the ascending process of the superior maxilla. In a large number of cases, the nasofrontal duct is not a tubular canal, but consists first of a bony ring, and then becomes a triangular anteroposterior slit. This is more like an ethmoidal cell, or an irregular meatus, than a duct. The nasofrontal duct tends to run from without inward, and to come into relationship with the upper part of the anterior end of the middle turbinate. When the nasofrontal duct has the cell form, the anterior end of the middle turbinate makes its inner boundary. The duct, therefore, is reached most easily through the nose, and through the anterior end of the middle turbinate. A curette introduced at this point and carried outward toward the lacrimal bone, then withdrawn a little and carried straight backward and downward, enters the anterior part of the labyrinth behind the ascending process of the superior maxilla and breaks down the cells through which the nasofrontal duct runs, destroying both the cells and the duct. Very little curetting is required to convert the anterior part of the labyrinth into a single cavity. In the roof of this chamber, usually in the anterior outer angle, the opening of the nasofrontal duct is placed. If it is the wish of the operator to clean out all the ethmoid cells, the posterior half of the labyrinth is entered by piercing the attachment of the middle turbinate and by curetting still farther backward, using all the while the outer side of the middle turbinate as a guide. If the head of the patient is held level, the middle turbinate guides the curette backward into the posterior ethmoidal cell. Often the posterior half of the labyrinth is a large cavity, made up of only one or two cells. This portion of the labyrinth has been, as it were, exenterated by nature. When the curette brings up against the back wall of the labyrinth, the remaining part of the middle turbinate and the lower half of the posterior turbinate are removed. The posterior part of the superior turbinate is taken away, flush with the front face of the sphenoidal sinus, which is free in the nasal cavity, and the outer part which has a common wall with the posterior ethmoidal cell. The posterior outer upper angle of the posterior ethmoidal cells is dangerous to curette or to probe.

It is of the uttermost importance that the operator should be sure of his landmarks in this locality. He orientates himself by finding the upper rim of the choana and then differentiating the free face of the sphenoidal sinus by proceeding upward from the rim of the choana close to the septum. Having made out the extent of the free face of the sinus, the width of the common wall between the sphenoidal sinus is made by the oblique vertical line, which is the attachment of the superior turbinate. The usual mistake made by the operator is to get

lost in the posterior ethmoidal cell—that is, he goes too high and too far outward, and considers the posterior wall of the posterior ethmoidal cell as the whole of the front face of the sphenoidal sinus. This mistake, if persisted in, will carry him into the brain. Insufficient removal of the posterior part of the superior turbinate and allowing the head to become tipped upward, are the chief causes of this confusion. After the landmarks of the front face of the sphenoidal sinus have been cleared and recognized, the sinus is entered near the septum, if possible, through the ostium—and the whole of the anterior wall removed.

The mishaps of the operation are entering the orbit through the lacrima bone and entering the posterior part of the anterior fossa of the cranial cavity at the apex of the orbit. The first accident is trivial; the second, fatal.

Puncture of the anterior end of the superior turbinate for catheterizing the frontal sinus or exenteration of the anterior ethmoidal cells is readily accomplished under cocaine anesthesia. For the complete removal of the anterior and posterior cells, especially if this is to be accomplished at one sitting, it is more satisfactory to use a general anesthetic."

An interesting cause of a *mucocoele of the ethmoid cells* alone, without any of the other sinuses being involved, is reported by E. C. Alles.<sup>1</sup> An external operation was done, and the ethmoidal labyrinth entered through the os planum. When this was broken through, there gushed out a brownish-colored, semigelatinous fluid. All of the ethmoid cells were curetted and their cavities thrown into continuity, one with the other. The frontal sinus was also curetted, and the large cavity was gently packed with gauze; the patient did well for twenty-four hours. The temperature then rose and death followed on the second day. The interesting part of the case was the postmortem finding. There was a suppurative meningitis extending over the right hemisphere, due to the *diplococcus lanceolatus*; several fissured fractures of the orbital plate of the frontal bone and in front of the crista galli, one extending into the middle of the sella turcica, partially covered by an extra dual hemorrhage about 1 c.c. in diameter. Examination of the general organs showed a status thymicolymphaticus. This case was evidently not one of death from status lymphaticus, as the author suggests, but from a rapid infection of the meninges directly consequent upon the operation.

## THE PHARYNX.

**Diphtheria.**—Concerning the TREATMENT OF DIPHTHERIA SINCE THE ADVENT OF ANTITOXIN, the aim of the investigator has been to develop some method of getting rid of the diphtheria organism. It is now well known that the diphtheria antitoxin attacks only the toxin elaborated

<sup>1</sup> The Lancet, December 14, 1912, p. 1645.



by the bacilli, and apparently has no effect whatsoever upon the bacilli themselves. In this regard it is rather interesting to note the results obtained by Menard.<sup>1</sup> The research work done by Menard shows that diphtheria antitoxin not only has no influence in the retardation of the growth of the Klebs-Löffler bacilli, but seems to be a particularly favorable culture medium for this organism. He found that the bacilli thrived well in a number of makes of antitoxin; in fact, they could be grown for several months in antitoxin, though by this time they lost some of their virulence and some of their staining properties.

It has recently been shown by numerous observers that it is possible to swamp out the diphtheria organisms from the throat by the use of a spray of some other form of organism, especially the *Staphylococcus aureus*. The results obtained by different researches are somewhat at variance, but there is a preponderance of opinion in favor of the view that the staphylococcus spray is of distinct value and that very little harm attends its use.

J. Fay<sup>2</sup> does not give very encouraging reports concerning its use. He has made a *comparison of the value of the sprays of Staphylococcus aureus culture and of a mild antiseptic solution* in the treatment of noses and throats of diphtheria carriers. Although the results give a slight advantage for the staphylococcus spray, the time required to rid the throat of the diphtheria bacillus by its use does not indicate any distinct antagonism between the staphylococci and the diphtheria organisms.

Frederick L. Wright<sup>3</sup> records his results on the treatment of diphtheria carriers occurring in the New York State Agriculture and Industrial School. He had tried all the old methods for ridding the throat of diphtheria organisms and then began to use a spray of the *Staphylococcus pyogenes aureus*. He found that with the old method the average time of isolation for carriers was thirty-four days, while with the staphylococcus broth the average time of isolation for carriers was eleven days. He concludes that this method appears to be absolutely innocuous and capable of causing the early disappearance of the diphtheria bacillus.

W. F. Lorenz and M. T. Ravenel<sup>4</sup> have used the *Staphylococcus pyogenes aureus* in the treatment of seventeen patients. They believe that pure cultures of the *Staphylococcus pyogenes aureus* sprayed into the throat and nasal cavity will cause the disappearance of the diphtheria bacilli. This treatment is most effective in pure carriers. They advise a combined nose and throat spray given at four-hour intervals on two succeeding days. The preparation used should be a fresh sus-

<sup>1</sup> Presse Médicale, August 2, 1913, vol. xxi.

<sup>2</sup> California State Journal of Medicine, May, 1913, vol. xi.

<sup>3</sup> Journal of the American Medical Association, July 5, 1913, p. 26.

<sup>4</sup> Wisconsin Medical Journal, July, 1913, vol. xii, p. 35.

pension of *Staphylococcus pyogenes aureus* in normal salt solution, or a bouillon culture twelve hours old, and the spray should have a temperature of about 96° F. The application should be made first into the pharynx over the uvula, the tonsils, and posterior pharyngeal wall, and then into each nostril. The amount should be sufficient to produce a "dripping wet" condition of the pharynx, and the nasal cavities should be sprayed until the patient feels it in the throat. The only complications in their series of cases were, one patient showed a coryza, another a laryngitis, and two developed small furuncles on the tip of the nose.

J. D. Rolleston<sup>1</sup> uses a staphylococcus spray only in chronic carriers or late in convalescence, as its use seems to produce a certain degree of discomfort, as evidenced by the fact that in all his cases except two there was a mild form of sore throat produced; however, no serious complications ensued. His method is to obtain a pure culture of the *Staphylococcus pyogenes aureus* and inoculate a bouillon tube and incubate this for from eighteen to twenty-four hours. The palate, fauces, and each nasal cavity were sprayed three or four times a day, and the tonsils and surrounding parts were swabbed with the solution. Of the ten cases treated in this manner, six faucial cases became negative within two to seven days. In the two nasal cases, the treatment was ineffective.

On account of the possible pathogenicity of the *Staphylococcus pyogenes aureus*, Harold B. Wood<sup>2</sup> has used a *spray of lactic acid bacilli*. His experience, however, is somewhat limited, but the results obtained were so encouraging as to make it worth while to try the lactic acid bacilli in the place of the staphylococcus. In one carrier the bacilli disappeared within a week, and in two others within twenty-four hours. In one case of severe diphtheria, in which thirty-three thousand units of antitoxin were given within forty-eight hours, the membrane was present up to ten days. By using the lactic acid spray, the membrane began to rapidly decrease, and had practically disappeared within three days, even with small vestiges of the membrane present on the tonsils, laboratory reports were negative.

**Fatal Hemorrhage from the Throat following Idiopathic Disease** is of sufficient rarity to make a case reported by J. D. Rolleston<sup>3</sup> of interest. The patient, a girl, aged six years, was supposed to be suffering from diphtheria. On the fifth day of the disease, she suddenly coughed and a huge gush of blood poured out of the mouth and death occurred within five minutes, preceded by marked cyanosis. No diphtheria bacilli were found. A necropsy showed abscess cavities in both tonsils, ulcerations of the uvula, soft palate, epiglottis, frenum of the epiglottis, vallecula and aryepiglottidean folds, and also deep ulcerations of the

<sup>1</sup> British Journal of Children's Diseases, July, 1913, vol. x, p. 298.

<sup>2</sup> Journal of the American Medical Association, August 9, 1913, p. 392.

<sup>3</sup> British Journal of Children's Diseases, February, 1913, vol. x.

laryngeal portion of the pharynx exposing muscular tissue; there were also three small, superficial ulcers above the right vocal cord. The exact spot of the bleeding could not be determined, and there was no evidence of erosion of the external carotid or other large bloodvessels.

An interesting case of **Pharyngeal Diverticulum** is reported by Waggett and Davis.<sup>1</sup> The opening of the pouch was at the upper edge of the cricoid cartilage on the posterior wall. The pouch was about three inches in length. At the first operation an attempt was made, through an external incision, to invert the pouch into the pharynx. This was accomplished, and it was pushed downward into the esophagus. After the invagination, its orifice, from the wound, appeared as a small slit, and this was closed by a layer of four uninterrupted sutures. However, about seven months later, during a violent fit of sneezing, the patient felt as though something broke in his neck and the old symptoms and difficulty in swallowing returned. Examination showed that the sac had returned to its original position, and at the second operation, except for a few adhesions, the sac appeared exactly as it did at first. This time the pouch was removed. The stump was carefully stitched with a continuous silk stitch and then buried by a layer of Lembert sutures. The wound was closed and drained. When the patient left the hospital he could swallow without the slightest difficulty or discomfort. Examination of the diverticula showed that the sac was composed of the mucous and submucous layers which had apparently become gradually invaginated between two definite parts of the inferior constrictor muscle.

There are certain **Defects of the Palate**, or rather what might be termed insufficiencies of the palate, which are rather difficult of treatment. Friedrich Neumann<sup>2</sup> suggests the use of *paraffin* in helping these defective structures to close off the nasopharynx by increasing their bulk. The cases in which the treatment is appropriate are paralysis of the palate, frequently of one side, or where the mobility has been destroyed by the cicatricial deposits following syphilis, or other ulcerative diseases, or following an operation for closing congenital fissures. The injections are made after cocainizing with a 20 per cent. solution. The paraffin should be put into movable structures, but not into the structures causing this motion; that is, they should not be put into the muscle, but between the muscle and the mucous membrane. He found that there are four places where the paraffin may advantageously be injected, namely, the posterior surface of the soft palate, the posterior wall of the epipharynx, and the two lateral walls of the pharynx. The location of the injection depends a good deal upon the results of the examination, and the cause and the position of the insufficiencies; for instance, in a one-sided paralysis of the soft palate, a small amount of paraffin is put into the posterior surface of the velum by introducing a needle through

<sup>1</sup> The Lancet, March 23, 1912, p. 768.

<sup>2</sup> Monatsschrift für Ohren. und Laryngo-Rhino., 1913, vol. xlvii, Heft 2, p. 289.



the anterior surface, while the amount of paraffin injected is watched through the rhinoscopic mirror. Again, when the palate is short and not very movable, the injection is best made along its edge and probably a small amount of paraffin can advantageously be put into the pharyngeal walls. When the palate has been injected, it should be immediately compressed by the index finger against the posterior pharyngeal wall so as to mold the paraffin into its proper shape.

## THE TONSILS.

**The Importance of the Tonsillar Structures of the Throat**, in their relation not only to local disease but also to the general health, is being more and more recognized, and during the past year the amount of literature that has appeared concerning these structures is greater than that of any other portion of the nose and throat. There is a constant attempt on the part of physiologists, bacteriologists, and others concerned with experimental research, to determine, if possible, the physiology of these organs; whether or not they have any active functions, and, if so, what is its nature.

Isaac Ott and John C. Scott<sup>1</sup> experimented with the dry, powdered tonsil of a calf. They found that when the filtered infusion of two grains of the powdered tonsil was injected into the cat by the jugular vein in divided doses, it produced a great fall of blood pressure, lasting about a minute, followed by a rise above normal, with a slower and stronger heart beat. Increase of this dose suddenly arrested the heart. In the same animal it was also a diuretic, increasing the flow of urine twenty times the original amount.

These results would be more interesting if the researchers had used the tonsils from animals of the same species as that into which the extract was injected. From clinical experience I have never seen any constitutional effect produced by the removal of even large masses of tonsillar tissue, except that due to the ether or the operation.

Louis M. Freedman<sup>2</sup> has written a fairly elaborate article on *tonsillar extracts*, reviewing the literature and recording some very interesting experiments. In association with Dr. Nelson, he made tonsillar extracts both of the extracellular substances and also of the intracellular. These were injected into the jugular veins of rabbits to whom were attached the regular circulatory and respiratory recording apparatus. Notwithstanding the results obtained by other observers, his results demonstrate conclusively that the tonsil possesses no substance which has any influence on the blood-pressure. He summarizes what he considers our present knowledge of the physiology of the tonsil thus:

<sup>1</sup> Proceedings for Experimental Biology and Medicine, 1912, p. 47.

<sup>2</sup> Annals of Otology, Rhinology, and Laryngology, 1913, vol. xxii, p. 186.

"It is fair to assume that the tonsil has a function, but probably only in the early years of life, also that there are other tissues in the body, as, for instance, the lymph glands which have the same function, that this function is mainly protective. Removal of the tonsil, therefore, does not remove from the body any organ or tissue absolutely necessary to the system, but, if not diseased, its removal has left the individual with one defence less.

While the above statement is, as a generalization, a fair representation of the facts, we must remember that it has never been proved that the tonsillar tissues of the throat act as protective organs, either locally or through the system at large, and, further, it is well known that the germinating follicles of the tonsils produce small lymphoid cells and that thus production is the only proved physiological action the tonsils possess.

W. W. G. Maclachlan<sup>1</sup> has given us the results of an elaborate pathological study of over three hundred and fifty pairs of tonsils, collected from the nose and throat clinic of the Mercy Hospital, of Pittsburgh. He has also reviewed a large part of the literature on the tonsil, though there is considerable published material which has not been brought to the notice of the writer. His studies do not enlighten us concerning the function of the tonsil, although the author states that they do not appear to have any important relation to the welfare of the body at large, and that they do not show any essential internal secretion. He is opposed to the view which has been advanced by such men as Kayser, Goodale, and Wright, that the tonsils may absorb foreign material from the mouth, because, in practically none of his specimens, was he able to find any carbon particles in the tonsil substance, even though the patients from whom they were removed lived in the smoky atmosphere of Pittsburgh, and, further, the upper cervical lymph glands into which the tonsils drain almost never contain carbon pigments. On the other hand, he believes that it is possible that lymphocytes and polynuclear leukocytes may escape through the so-called "physiological wound," described by Stohr, and may exercise a bacteriocidal action in the vicinity of the exclusion.

**Pathology of Tonsillitis.** The most interesting part of Maclachlan's work is on the histological study of pathological conditions of the tonsils. He divides the acute inflammations of the tonsils into *acute lacunar tonsillitis*, *acute parenchymatous or true follicular tonsillitis*, and *acute peritonsillitis*. *Acute lacunar tonsillitis* is a suppurative process involving at first the epithelium of the deeper portions of the crypt. This condition is similar to the ulcer formation found in the appendix described by Aschoff, and the ulcer frequently extends deeply and evades the tonsillar substance by destroying the epithelial lining. Although none of the tonsils which he examined were removed during attacks of acute

<sup>1</sup> Publication of Pittsburgh School of Medicine, December, 1912.

tonsillitis, this ulceration of the epithelium of the crypts was present to a greater or less extent in 55 per cent. of all cases. He found polymorphonuclear leukocytes closely packed in the crypts around the ulcerated area, and they were undoubtedly phagocytic. He regards the ulceration of the lining of the crypts as a vulnerable point of entry for organisms from the mouth. It matters little, apparently, what bacteria produced the lesions, for, once the ulcer is formed, it is possible for any type of organism to gain access to the deeper tissues. *Acute follicular tonsillitis* is characterized by the formation of small abscesses which begin in the centre of the follicle. The follicles are generally infected independently of one another, although sometimes in very severe cases it is possible that the abscess of one follicle may break down into another. He has not been able to demonstrate the presence of bacteria within the tonsil tissue proper, save in the immediate region of an ulcer or abscess. *Acute peritonsillitis*, or *quinsy*, does not originate in the tonsil proper, but rather through the mucous glands of the peritonsillar tissues which open into the mouth beyond the border of the tonsil.

The chief criticism of this part of the work of MacLachlan, on acute inflammation of the tonsil, is that he describes in detail the pathology of acute tonsillitis when he has never had the chance, according to his own statement, of examining a tonsil which is clinically acutely inflamed. His conception of an acutely inflamed tonsil is based upon the finding of small diseased areas within apparently normal or unaltered tonsillar tissue.

In speaking of chronic inflammation of the tonsils, the author discusses this disease under (1) chronic lacunar tonsillitis; (2) fibrosis of the tonsil; and (3) chronic peritonsillitis. In *chronic lacunar tonsillitis*, the epithelial lining of the crypts becomes irregular due chiefly to a dilatation of the finer branches of the main crypts, also to the fact that the epithelial cells are more widely separated, and the spaces between them are packed with cells which are migrating into the crypts. Sometimes there are marked papillomatous projections covered with a thick layer of squamous cells which may keratinize. Ulcers in the various stages of healing are also met with in the lining of the crypts. In chronic lacunar tonsillitis the crypts are usually dilated, sometimes with widely gaping, and at other times with narrowed, mouths. Occasionally there is an apparent complete blockage of the outlet of the crypts, so that a type of retention cyst is formed. In 2 cases he noted that the contents had broken through the walls of the sac and had invaded the tonsillar tissue, but even in these cases he could not demonstrate any leukocytic infiltration or other evidence suggesting inflammation as a consequence of this rupture. Cholesterin crystals and keratinized epithelium are frequently found in the debris of these dilated crypts, the mouths of which are not sufficiently large to prevent the accumulation of the debris. *Fibrosis* he regards as the end-result of an acute inflammation



of the tonsil, or a degenerate condition following a hypertrophic tonsil. *Chronic peritonsillitis* is characterized by marked thickening of the capsule and by an infiltration with characteristic inflammatory cells, that is, lymphoid cells, plasma cells, and occasionally eosinophiles and mast cells, in the capsular tissue. Maclachlan believes that hypertrophy of the tonsils is due to repeated attacks of tonsillitis. There is no characteristic or uniform microscopic picture of the hypertrophy of the tonsil.

Concerning tuberculosis of the tonsils, Maclachlan has found primary tuberculosis in only about 1.4 per cent. of his cases, but his own research work does not cover any great amount of material. He believes that, in the cases of primary tuberculosis, the tubercle bacilli gain entrance to the parenchyma of the tonsil through an abraded area in the epithelium of the crypts, such as would be found in ulcerative lacunar tonsillitis.

Several years ago I had the opportunity of examining, histologically, a pair of tonsils which were removed while they were acutely inflamed. This work of Maclachlan's substantiates my findings at that time concerning the method of penetration of pyogenic organisms into tonsillar substance. First, there must be a destruction of the epithelial lining of the crypt, and this destruction takes place as the result of the action of the toxin elaborated by the organisms within the crypt of the tonsils. I was able to demonstrate the streptococci passing through the epithelial gaps and making their way toward the germinating follicles of the tonsils, where, as originally shown by Goodale, numerous minute abscesses begin and grow in size until they rupture into the crypts. However, destruction of the epithelium is not always necessary for certain bacteria, such as the tubercle bacilli, to gain access to the tonsil parenchyma. I have shown that the tubercle bacilli will pass through unaltered cryptal epithelium, and in fact will pass through the tonsil completely, without leaving any trace, and infect the glands of the neck into which the lymphatic passes.

Last winter I had the opportunity of carrying out a series of experiments on the hog, studying the penetration of bacteria from the crypts into the parenchyma. I used anthrax bacilli because of their known pathogenicity to hogs, and the ease with which they can be demonstrated in tissue substance. (See Transactions of the American Laryngological Association, 1913.) Anthrax bacilli placed on the surface of the tonsil will penetrate into the crypts and then pass directly through the normal epithelium and gain access into the tonsillar substance before the epithelium has shown any evidence of necrosis. After penetrating between the superficial cells, the anthrax bacilli tend to accumulate in the deeper layers of the epithelium. As a result the action of the toxin, a devitalization of a portion of the epithelium takes place, which opens up a pathway for a secondary infection with

pyogenic cocci. These cocci, having gained access to the parenchyma of the tonsil, may cause an independent area of destruction, but usually they form a second zone behind the line of invasion of living tissue made by the anthrax bacilli. An important feature of the work was shown that while the anthrax bacilli were placed not only over the surface of the tonsils, but over the surrounding mucosa of the mouth and pharynx, in none of the experiments was there any infection of the mucous membrane of the mouth or pharynx except through the epithelium of the tonsillar crypts.

Considering the evidence, it must be accepted that there is no method of invasion common to all the microorganisms. The fact is, that some forms of bacteria can penetrate the normal epithelium of the crypts, and that other forms require the destruction of the epithelium before they can gain entrance.

E. Fletcher Ingal<sup>1</sup> says that he does not believe that there is any *relation between the tonsils and pulmonary tuberculosis*. This is probably true, but the data which he has collected in support of such an assertion is not so convincing. His observations were made only on the clinical appearance of the tonsils and of the cervical lymph nodes, and it is well known that even by histological study of the tonsil a small tuberculous nodule, sufficient to infect the whole chain of cervical lymph nodes, may escape notice.

An interesting publication on the *toxicity of human tonsils* has been given us by Geo. F. Dick and W. H. Burmeister.<sup>2</sup> From their study of already existing literature on the subject, Dick and Burmeister say that, as a result of tonsillar infection, such conditions as asthma, convulsions, and even true epilepsy may be produced. It has generally been thought that such conditions as these arise from soluble toxins derived from the bacteria of the tonsillar crypts, but, according to their statement, the usual bacteria found in the tonsils do not form soluble toxins. They quote from Dodd and Aoki who, only after a great deal of difficulty, were able to produce anaphylatoxin from the streptococcus found in the tonsils. In their own work, Dick and Burmeister made extracts from the proceeds of thirty-two tonsillectomies. These extracts were made by grinding the tonsils in a mortar with 10 c.c. of salt solution. This material was then centrifuged or filtered through paper, and carefully examined bacteriologically for its germ contents. They found that this extract would kill rabbits, guinea-pigs, and dogs, causing symptoms very similar to anaphylactic shock, and this extract contained a substance which manifested many of the characteristics of the so-called anaphylatoxin of Friedberger. They further found that some of the tonsillar extract seemed comparatively harmless and that the bacteria flora was the only factor that seemed to

<sup>1</sup> Journal of the American Medical Association, July 12, 1913, p. 113.

<sup>2</sup> Journal of Infectious Diseases, September, 1913, p. 273.

bear any relationship to the toxicity of the extract, and also that the poisonous extracts were usually obtained when typical hemolytic streptococci were found on the plate in large or predominating numbers. Nevertheless, only once in six attempts were the authors, following the method of Friedberger, successful in obtaining an anaphylatoxin from the organisms grown on the plate, and they, therefore, believed that the tonsils must present conditions very favorable to the formation of toxins.

This article is very interesting as to the significance of the bacteria found in the crypts of the tonsils. There is no possible way of eliminating the crypts in making extracts of the tonsillar substance on account of the fine divisions of the crypts which penetrates to all parts of the tonsillar tissue. Therefore, the extracts made by Dick and Burmeister do not necessarily show a toxicity of the tonsillar substance alone, as their extracts must include some cryptal contents. It seems doubtful whether any important data is to be gained from the making of tonsillar extracts, as every extract thus made must be contaminated with the bacteria and their toxins which are almost constant inhabitants of the crypts.

The work of J. Gordon Wilson<sup>1</sup> on *tonsillar plasma cells* bears directly on the question of the *relation of the cryptal contents to the tonsillar substance*. He combats the view of D. J. Davis, who held that the presence of the plasma cells in the tonsils, the appendix, the adenoid tissues of gastro-intestinal tract, the lymph gland and spleen is due to a chronic infectious process. Davis apparently believes that their sole cause of existence in the tonsil is a tissue reaction to an infection originating in the crypts. Wilson sums up his position thus: "Plasma cells are derived from lymphocytes, and are engaged in removing and utilizing cell material which is broken down. If it be pathological to destroy albuminous bodies and toxins arising from katabolic processes, and possibly also of bacterial origin, then plasma cells are pathological. They are not degenerated cells but cells actively engaged in combating the toxins which pass through adenoid tissue. Their presence, instead of showing that the tonsil is diseased, indicated that it is functionally active. Their presence in excess shows that we have some focus of disease, but not necessarily a local one." Granting Wilson's conception of the importance of their presence is correct, yet it is rational to believe that the irritant necessary for their production can be most easily accounted for by admitting the possibility of the absorption of toxin, a product of the bacterial flora of the tonsillar crypts; but we must admit that the mere presence of plasma cells in the tonsils is not in itself a sufficient reason for operation, especially as it is possible that every tonsil is subjected, for the greater part of its existence, to the toxic action of the bacterial products of its crypts.

A little further light concerning the *importance of the organisms of*

<sup>1</sup> Journal of the American Medical Association, August 2, 1913, p. 345.



*the tonsillar crypts* is furnished by Henke and Reiter.<sup>1</sup> They studied the streptococci found in 71 cases of tonsillitis. In their conclusions, they state that the tonsils, in perfectly well persons, may hide not only anhemolytic, but also hemolytic streptococci; that the anhemolytic streptococci are not always non-pathogenic and that they, as well as the hemolytic streptococci, can produce a tonsillitis either of very light severity or one so severe as to lead to the death of the patient. They further show that phlegmonous angina is in its origin caused by streptococci, but that staphylococci can enter secondarily and then increase the severity of the attack.

*The importance of streptococci in the production of epidemic sore throat* of milk-born origin is shown by E. C. Rosenow.<sup>2</sup> His studies demonstrate that a streptococcus of a peculiar nature occurs in predominating numbers in epidemic sore throat of milk-born origin. These organisms differ from the ordinary streptococcus pyogenes in producing a more abundant growth, in being encapsulated and not forming chains, and in causing but little hemolysis. In artificial cultivation, these strains sooner or later assume characteristics of the Streptococcus pyogenes, and, on the other hand, by placing the Streptococcus pyogenes in unheated milk, it becomes so modified that it corresponds to the streptococcus of epidemic sore throat. This fact that milk may modify streptococci is a strong indication of the important part that the dairy plays in epidemic sore throat. It has been shown that milk drawn in a sterile way from normal cows may contain virulent streptococci and for this reason even certified milk, while less contaminated than ordinary milk, may contain pathogenic bacteria. Also these organisms can be found in butter and cream.

Confirmation of the view that the *inflammatory changes* so frequently found in *tonsils* are of bacterial origin, is given in an article by K. H. Digby.<sup>3</sup> He says that, even before his work, the fact that bacteria can pass through the normal epithelium of lymphatic glands was demonstrated by Ruffer, in 1890, and by Ribbert and Rizzozzero as early as 1885. Digby says that in normal animals large numbers of bacteria can be constantly found in the lymph structures of the appendix, Peyer's patches, and some cocci in the tonsils. Most of the bacteria are intracellular. Solitary bacteria and cells loaded with bacteria can also be seen in their passage through the epithelium. His article is illustrated with photomicrographs showing the bacteria in the lymphatic tissue. He believes that the chief significance of bacteria in the subepithelial adenoid tissue is to give support to the view that the subepithelial lymphatic glands protect the body against bacterial infection by autovaccination.

<sup>1</sup> Berliner klin. Wochenschrift, 1912, No. 4.

<sup>2</sup> Journal of Infectious Diseases, 1912, p. 338.

<sup>3</sup> The Lancet, June 21, 1913, p. 1731.

These findings of Digby are quite interesting, but I believe that they should be substantiated by similar findings in human beings. I have frequently seen, in tonsillitis, bacteria passing through the epithelium after it has been destroyed by the toxic action of bacteria in the crypts, but have been unable to demonstrate the presence of bacteria in the parenchyma of the tonsil, when examining organs that were supposed to be normal. They exist, however, in large numbers in the cavities of the tonsillar crypts. Certain forms of pathogenic bacteria, such as the tubercle bacilli and the bacilli of anthrax, have been demonstrated actually passing through the normal epithelium. It is probable that the subepithelial adenoid tissue of the gastrointestinal tract, including the tonsils, is of importance in the production of immunity, but it is doubtful whether the tonsillar tissues of the throat ever carry out this function to a sufficiently large extent to make their retention an essential factor to the well-being of the patient.

On the other hand, it is being demonstrated with more distinctness as time progresses, that the tonsils may act as avenues of entrance for toxic material, not only locally but also to the general system.

In a very exhaustive paper, which is characterized by evidences of careful work, W. P. S. Branson<sup>1</sup> gives us the results of his examination of 75 cases of *Sydenham's chorea*. His belief is that Sydenham's chorea and rheumatic fever are due to one and the same infecting agent and he has shown that the commonest avenue of rheumatic infection is the tonsil, and next to it the nose.

As the result of his findings, he believes that the first essential of rational treatment of rheumatic infection is the restoration of the upper air passages to a healthy condition. For this purpose, he suggests irrigation and thorough cleansing of the nasal passages, combined with antiseptic treatment of the nose and pharynx. Enucleation of the tonsils should be done without delay in all rheumatic children, who exhibit either chronic enlargement of the tonsils or of the tonsillar lymph glands.

Passler<sup>2</sup> argues in a similar mood, believing that *chronic tonsillitis* is an important factor not only in articular rheumatism and chorea, but also in such conditions as erythema nodosum, dyspepsia, sciatica, both acute and subacute recurring nephritis, chronic endocarditis, and myocarditis. He urges radical tonsillectomy for any of these diseases which show a tendency to drag along or recur.

D. J. Davis<sup>3</sup> gives us the result of his observation in 42 cases of *chronic Streptococcus arthritis*. In all of these cases the atrium of infection was apparently in diseased tonsils. Cases of chronic arthritis of other origin were observed, but in this study he collected only those in which

<sup>1</sup> British Medical Journal, November 23, 1912, p. 1429.

<sup>2</sup> Therapeutische Monatshefte, January, 1913.

<sup>3</sup> Journal of the American Medical Association, September 6, 1913, p. 724.

the tonsils were supposedly the source of the infection. In order to avoid surface contamination, he made his cultures from the depth of the crypts after the tonsil was incised with a sterile knife. In his summary he says: "In this group of cases, the fact that in the majority the tonsils are found diseased, that an acute tonsillitis often ushers in an attack, and that the removal of the tonsils in some cases brings on an acute exacerbation, all point to the tonsil as the atrium of infection. Other atria exist, of course, but are relatively rare. Extirpation of the diseased tonsil leads commonly to marked improvement or to complete relief. In nearly all cases a hemolytic streptococcus, often in pure culture, can be found in the diseased tonsils. This streptococcus invariably produces arthritis in animals, which may become chronic. Injection of moderate doses of the dead autogenous streptococci may cause acute reaction, manifested by redness and tenderness of the involved joints, but the value of autogenous vaccines in the treatment of many of these cases seems unquestionable. These facts are arguments in favor of this streptococcus being the causative agent."

A. Vetlesen<sup>1</sup> describes a number of cases of *general sepsis following chronic tonsillitis*, and 14 cases of acute rheumatism in which 78 per cent. had a manifest acute or chronic tonsillar infection. He believes that the infection in these cases is a streptococcus that has undergone some special change in the interior of the tonsil. His experience has further shown that, in the cases with chronic tonsillitis in which polyarthritis develops, it is of a protracted form with exacerbations, but that in the group with acute tonsillitis followed by acute rheumatism both the tonsillitis and the rheumatism are of an acute, benign type and will be followed by complete recovery.

A rather remarkable series of 7 cases of acute thyroiditis is reported by Clement F. Theisen.<sup>2</sup> Six of these cases of *thyroiditis followed tonsillitis*. Two of the cases subsequently developed well-marked goitre, and two others had attacks of hyperthyroidism frequently following acute tonsillitis. Suppuration did not occur in any of these cases.

Some interesting facts concerning the production of *albuminuria in acute tonsillitis* is given us by H. Kosokabe.<sup>3</sup> He shows that the passage of albumin through the kidneys is not dependent upon the fever, as it has been found at times when there was no fever, and, when there was fever, the nephritis often kept up after the temperature had become normal. He found few casts, and never hematuria. Most of his patients were mouth-breathers, and the condition appeared most frequently between the ages of twenty-one and thirty years. He found the albuminuria in 72 per cent. of all his cases.

By using the *x-ray in the treatment of enlargement of the pharyngeal*

<sup>1</sup> Norsk Magazin for Laegevidenskaben, April, 1913, No. 4.

<sup>2</sup> Albany Medical Annals, 1913, vol. xxxiv, p. 465.

<sup>3</sup> Archiv für Laryngologie und Rhinologie, vol. xxvii, Heft 3, p. 421.



and faucial tonsils, W. Stewart<sup>1</sup> endeavors to dodge operative interference. From his experience, he believes that the *x*-ray has a stimulating influence upon the chronically inflamed adenoid tissue, enabling it to resume its healthy condition. Though the tonsils treated with *x*-rays do not regain, what he calls, their normal size, the diminution is sufficient to dissipate all obstructive symptoms, and conditions resulting from the septic state of the tonsils and adenoids are relieved. The raying is done first from the one side and then the other, with the head so inclined that the rays can sweep up in front of the vertebral column. A very important advantage of the use of the *x*-ray is that it affects all the lymphoid tissue of the pharynx.

H. B. Ashby<sup>2</sup> offers an interesting idea of the *etiology of tonsillar hypertrophy*, namely, that the enlargement is apparently an attempt on the part of nature to supply the tissues of the body with lymphoid cells which for some reason or other are deficient in number. He says that children with enlarged faucial and pharyngeal tonsils are deficient in lymphocytes, while there is an actual increase in the total leukocyte count, and that, therefore, knowing that tonsillar tissue produces lymphocytes, it would seem rational to believe that a demand for this lymphoid substance, on the part of the body as a whole, produces an increase in the size of the tonsils. Acting on this theory, he made an attempt to supply the demand by the injection of gland extract. So far he has treated about 30 cases with lymphatic extract prepared by Burroughs and Welcome, and nearly all the children thus treated have improved in a very satisfactory way.

**Tonsillectomy.** An extremely illuminating survey of the *indications for tonsillectomy* is given us by J. L. Goodale.<sup>3</sup> This article deserves careful reading in the original, but we only have space here to put in some of his conclusions in brief form. He says that it has not been demonstrated that complete removal of the tonsil is followed by harmful effects upon the general system, and believes that, for the larger number of cases, tonsillectomy should be given preference over tonsillotomy. Tonsillectomy shows a larger percentage of complications than does tonsillotomy, but this is due as much to the relatively larger number of septic conditions, in which of late years an operation is undertaken as to the greater trauma usually occasioned. The possible increase in hemorrhage, following the radical operation, is never sufficiently serious to contra-indicate its use. While gross deformities of the part involved are not likely to follow tonsillotomy, yet cicatricial adhesions of the lacunar orifices is frequent, and may lead to an exacerbation of the original chronic inflammation. Tonsillectomy in unskilled hands may be followed by marked and injurious distortions, but with good technique it should have no other alteration than occasionally

<sup>1</sup> British Medical Journal, May 31, 1913, p. 1157.

<sup>2</sup> Ibid., p. 1159.

<sup>3</sup> Boston Medical and Surgical Journal, October 2, 1913, p. 485.

a partial fusion of the pillars. The indications for the radical operation should be determined by pathological changes in the tonsils which are actually a detriment to the individual, while simple hyperplasia may sometimes be sufficiently treated by tonsillotomy, especially in children.

In chronic tonsillitis, a simple tonsillotomy may increase the trouble; hence, in these cases, complete removal is preferable. Infection of the fauces by very virulent microorganisms may take place after removal of the tonsils. Recurrent local infections, or general infections having their origin in the tonsils, require tonsillectomy as soon as a favorable moment for operating arrives. Recurrent acute catarrhal infections of the throat require complete removal of the tonsils, though immunity against subsequent attacks is not necessarily assured. Local tuberculosis of the tonsil requires complete removal. In young children with adenoid enlargement requiring an operation, removal of the tonsils should not be done unless they are causing injury or favoring attacks of acute middle-ear inflammation. Tonsillectomy may be done, if the technique is properly carried out, without injury to the speaking voice. It is probable that the singing voice will be lowered by the removal of the tonsils, and in truly fine voices the operation should never be done if it can be avoided.

My own feeling at present is that tonsillectomy is always the preferable operation when any sizable operation on the tonsil is indicated.

R. Goldmann<sup>1</sup> believes that the finding of crystal plugs is a positive indication for tonsillectomy, as sooner or later they will act as a distinct danger to the entire organism. Cleansing of this debris from the crypts, while important as a means to diagnosis, should not be considered in the light of a therapeutic measure. On the other hand, he believes that it is not justifiable to remove the tonsils when this cryptal debris is not present simply because there is some general infection, and that the absence of result when the operation done under such circumstances discredits the operation in the eyes of the laity. He does not believe that the removal of the tonsils can in any way injure the singing voice, and it may be actually benefited by such removal.

Goldmann's conception of the importance of the "cryptal plugs" is not tenable, while in a large number of cases they are the source of cryptogenetic infection or local irritation, in others they seem absolutely innocuous. Again, many tonsils, the crypts of which seem perfectly free, give rise to serious infections. I have seen absolutely innocent looking tonsils, when examined under the microscope, appear riddled with miliary tubercles. Frequently, after removing tonsils, small abscesses or inclusion cysts of the deeper part of the crypts are found just under the capsule.

There has been very little added to the *technique of the operative*

<sup>1</sup> Monatschrift für Ohrenheilkunde und Laryngo-Rhinologie, 1913, vol. xlvii, p. 1028.

removal of the tonsils during the past year, though there is a tendency to a slightly wider use of Sluder's method. Sluder<sup>1</sup> himself still claims that over 99½ per cent. of the tonsils can be removed with this instrument, though not always at the first try, but that it is perfectly feasible if a portion of the tonsil is left, after the first setting of the guillotine, to go back again and repair this fault. He still adheres to his original model, but has added the use of a mechanic's dog which increases the pressure of the blade. He insists that the blade of the instrument should be simply dulled and not too blunt, as then the tissues are apt to slip from its grasp and difficult repair work cannot be done.

Wm. E. Sauer<sup>2</sup> has modified the Sluder instrument by bending the thumb-piece downward and perforating the handle with a screw which enables the instrument to be used in the manner of an *écraseur*.

John F. O'Malley<sup>3</sup> says that every tonsil can be removed completely with its capsule by a properly modified guillotine, but some cases present certain difficulties. He then proceeds to describe in detail the removal of the tonsil with an instrument very similar to that of Ballenger's modification of the Sluder. The author says that his method of operating is not Sluder's, that it agrees with it only in the application of the reverse, or outer, aspect of the blade to the tonsil, and in the use of the finger for pushing the gland through the ring.

Concerning the *results following tonsillectomy*, J. Payson Clark<sup>4</sup> publishes the findings in 163 patients reporting in person at his clinic in answer to a postal card inquiry. The summary of this investigation is as follows: Patients, with few exceptions, were under fifteen years of age at the time of the operation. Hemorrhage calling for special treatment, after tonsillectomy, is of rare occurrence. The conditions for which the tonsils were removed was relieved in very nearly every case, even in those in which there is still tonsil tissue. Improvement in the general health is expected after tonsillectomy when it is done for cause. Children who have had tonsillectomy certainly show no increased tendency to disease, and are probably less susceptible than before operation. The present state of health was excellent in the great majority of cases. What was apparently tonsil tissue was found much more often than one would expect after a supposed tonsillectomy. In the great majority of cases, the soft palate was symmetrical, the faucial pillars of the fossæ being normal. There was an accidental removal of the uvula in 4 cases, but this had caused no inconvenience. No investigation was made concerning the singing voice, but the ordinary voice was practically unaffected by the operation. In almost all of the cases in which the large cervical glands were still present, he found that there was some tonsil tissue on the same side, and there were no enlarged glands in nearly half of the cases in which tonsil tissue was still present.

<sup>1</sup> Journal of the American Medical Association, March 1, 1913, p. 650.

<sup>2</sup> Ibid., May 12, 1912, p. 1355.

<sup>3</sup> The Lancet, July 5, 1913, p. 19.

<sup>4</sup> Annals of Otology, Rhinology, and Laryngology, 1913, vol. xxii, p. 421.



Investigations concerning the *relative advantages and disadvantages of tonsillotomy and tonsillectomy* have been undertaken by Harold Whale.<sup>1</sup> In this investigation there were examined 110 cases of tonsillotomy and 110 of tonsillectomy, chosen at random from a clinic in St. Bartholomew's Hospital. The author believes that tonsillectomy is the more dangerous operation, as there is a greater risk of hemorrhage after the operation; that harmful deformities may arise after the operation, such as an adhesion of the posterior faucial pillar to the posterior pharyngeal wall, or overgrowth of the plica triangularis, and that there is a risk of producing voice trouble, even without any apparent causative deformity. In tonsillotomy, there is a danger of initiating an infection which may manifest itself either as a tonsillitis or as a lymphadenitis, or both. This danger is greater after a very free and deep removal has been performed than when only a moderate amount of the tonsil has been removed. There is very apt to be a return of the trouble for which the operation was performed, except as concerning the voice when a return is no more probable than after tonsillectomy. The author closes by saying: "Thus it would appear that tonsillectomy is the more dangerous operation, but, with the single exception of voice trouble, it is more likely to permanently cure the complaint for which advice is sought. Notably so in the case of tonsillitis and lymphadenitis. Moreover, these two infections are never initiated by tonsillectomy."

Mackensie<sup>2</sup> reports a case of *death after tonsillectomy* due to deep infection of the neck, leading to a fatal pneumonia.

**Peritonsillar Inflammation.** The *etiology of peritonsillar abscess* has been in the past explained by different authors as due to an infection penetrating the peritonsillar region in one of three manners: either it is carried from the tonsils by the lymphatic vessels, or an infection starting in the depths of the tonsil finds it easier to break through the capsule than to gain an exit into the mouth, or by passing down through the ducts of the mucous glands surrounding the tonsil, gains access to the deeper structures.

D. R. Patterson<sup>3</sup> says that 98 per cent. of the cases of peritonsillitis start by the infection penetrating into the peritonsillar tissues on the upper and outer aspect of the tonsil. His explanation of the reason for this position of the entrance of the infection is as follows: The supratonsillar fossa, which is the remains of the upper part of the embryonic tonsillar sinus, is surrounded by only a very small amount of lymphoid material, or none at all. During the retrogression of the tonsillar tissue, which begins at about fifteen years of age, there occurs a physiological sclerosis, and the thicker the adenoid tissue, the stronger will be the fibrous barrier which replaces it. Where it has been thin or absent, as around the supratonsillar fossa, very

<sup>1</sup> The Lancet, February 15, 1913, p. 444.

<sup>2</sup> Ibid., June 21, 1913, p. 1735.

<sup>3</sup> Journal of Laryngology, Rhinology, and Otology, 1913, vol. xxviii, p. 453.

little or no fibrous tissue is deposited. At this position there is a large crypt which is frequently filled with septic secretions, which, under the proper circumstances, will penetrate the surrounding wall and attack the peritonsillar tissue. Patterson also says that the upper part of the tonsil which surrounds the supratonsillar fossa is much more liable to inflammatory attacks than is the lower, or less complicated, portion. For this reason, and the fact that the infection of peritonsillitis takes place through the upper part of the tonsil, Patterson believes that, in the treatment of recurrent quinsy, it is not necessary to remove the whole of the tonsil but simply to remove the upper pole. In some cases, Rosenberg's procedure of simply opening up the supratonsillar fossa by passing a bistoury into it and cutting across the anterior pillar, renders further operation unnecessary.

Although Patterson's idea of the method of penetration of the infection from the tonsil to the peritonsillar tissue is probably correct in the greater number of cases, his method of treatment does not appear to me to be a wise one. I do not believe that simple slitting up the supratonsillar fossa will prevent a recurrence of the peritonsillar infection. Further, if the upper pole of the tonsil is to be removed, we might as well remove the whole tonsil. The dissection of the upper pole of the tonsil, especially in cases which have suffered from repeated attacks of peritonsillar abscess, is the most difficult part of the operation in radical removal of the tonsils, and as peritonsillitis is, in the great majority of cases, a disease of adult life, I see no reason why any portion of the tonsil should be left behind.

Henke<sup>1</sup> is probably correct when he says that a suppurative peritonsillitis of the faucial tonsil does not, as the majority of authors appear to believe, originate in one particular manner, but rather that there are a number of pathological conditions which, existing, in the immediate neighborhood of the tonsil, may lead to a peritonsillar infection, and that there are a number of different pathways by which the infection may gain entrance to the peritonsillar tissues.

In the TREATMENT OF PERITONSILLAR INFLAMMATION, Henke suggests the local application of an *antistreptococcus serum*. He first studied its action in animals. He produced in rabbits a localized streptococcus infection severe enough to lead to a general invasion causing death. He found that if the infected wounds were treated within twelve hours after the inoculation by the application of powdered antistreptococcus serum, the majority of rabbits recovered. He then extended his studies by infecting the uterus of pregnant rabbits with streptococci, and found that all such rabbits died from general sepsis in from three to four days. Four rabbits inoculated in this manner were treated by injecting the serum into the uterus six hours after the inoculation, and all of these rabbits recovered. Four rabbits with the uterine

<sup>1</sup> Archiv für Laryngologie und Rhinologie, 1913, vol. xxvii, Heft 2, p. 289.

infection went twenty-four hours before the application of the serum, and, of these four, two died and two recovered. These favorable results led him to the use of the serum in peritonsillitis.

His method was to inject 2 to 3 cm. of the serum through a needle which had been driven to a depth of  $1\frac{1}{2}$  to 2 cm. The position of the injection was determined by a careful inspection as to the exact point of the greatest inflammatory infiltration. So far he has treated 35 cases, and has not seen any untoward complications. Concerning the influence of this method of treatment on the course of the disease, he found that, in those cases in which there was already fluctuation, the serum seemed to have no effect upon the process except, perhaps, to bring about a more rapid spontaneous rupture of the abscess. The result, however, was entirely different when the injection was made in the early stage before the abscess had formed. He has had 20 cases in which the suppuration was prevented by this method. He repeatedly found that within a few minutes after the injection the severe pain disappeared, and the patient could eat and drink with comparative comfort. On the next day, the swelling had greatly decreased, and, by the second or third, had almost gone.

So far as I know, this method of treating peritonsillitis is unique and does not seem as though, when carried out under proper precautions, it would be accompanied by any serious complications. As it is apparently easy to do, I see no reason why it should not be used as an abortive measure. However, incision and evacuation of the abscess after pus has formed gives such prompt relief, in the large majority of cases, that it is hard to imagine an improved substitute.

### THE LARYNX.

An instructive study of the tonsillar tissues of the ventricle of Morgagni is published by Imhofer.<sup>1</sup> The ventricle varies in its general plan from a very complicated structure, consisting of a number of pockets and crypts emptying into a main duct, down to a single simple blind crypt. This latter condition, however, is very rare. Occasionally the main duct branches and sends a downward prolongation toward the vocal cords, forming a T-shaped ventricle. The walls of the ventricle are formed by the false cords on the inside, and by a thin layer of connective tissue, muscle, and glands closely associated with the perichondrium of the thyroid cartilage on the outside. Except in very rare cases, a greater or less amount of lymphoid tissue is found in these walls. The arrangement of this lymphoid tissue is exceedingly variable, and it is probably because of this variableness that authors have differed in their descriptions of the anatomy of this structure. In 80 cases

<sup>1</sup> Zeitschr. für Laryngologie und ihre Grenz., 1913, vol. vi, Heft 4, p. 551.



examined, lymph follicles were found fifty-eight times. At those places where the adenoid tissue was in direct contact with the epithelium, there was a migration of round cells through it, and the superficial layers were rapidly desquamating. In this feature, the ventricle very closely resembles a tonsil. The round cells are found in the ventricle at four months of age, at two years the follicles appear, and at this time the lymphoid tissue of the ventricle of Morgagni has reached its complete development.

**X-ray Pictures of the Larynx** have not been very instructive, according to Rethi,<sup>1</sup> on account of the difficulty of proper orientation. Rethi's new method consists in placing a pear-shaped film into the hypopharynx and upper part of the esophagus, and taking the picture with the x-ray tube in front of the larynx. The films are roughly pear-shaped, with round corners, carefully packed and protected with wax paper. After cocainization of the back of the tongue, the soft palate, the epiglottis, and the region of the arytenoids, and the tolerance of the patient determined, the films are introduced. The utmost quietness on the part of the patient is necessary for good pictures. Rethi shows several photographs in which the position of both the false and true vocal cords are very clearly shown, as is also the lumen and capacity of the subglottic and supraglottic regions.

**Treatment of Diseases of the Larynx.** What seems to be a useful addition to our armamentarium for the treatment of diseases of the larynx is the use of a *hot air box*, suggested by Albrecht.<sup>2</sup> Albrecht uses the application of heat in order to produce an active hyperemia of the laryngeal mucosa. He employs a box which fits over the neck and upper part of the chest, to which heat is brought by means of a tube. The tube is conical, and ends in a funnel which is fastened over the flame of a bunsen burner or alcohol lamp. The treatments should last from one-half to three-quarters of an hour, and the temperature should be from 100° to 110° C. This degree of heat can be repeated daily without danger to the skin or the production of disagreeable symptoms, though repeated applications on the same day may produce a slight burning. Albrecht claims that this hot air treatment is useful in acute laryngitis, subacute and chronic laryngitis, especially the dry type, although he admits that the results will not be good if the disease is of long standing and the changes in the tissues are of a serious nature. It seems of particular value in the treatment of edema of the larynx resulting from tuberculous infection. Albrecht says that the benefit of the hot-air treatment is due to the absorbing property of the increased blood current.

There has recently been considerable progress made in the TREATMENT OF CHRONIC LARYNGEAL STENOSIS. The majority opinion is that

<sup>1</sup> Zeitsch. für Laryn., Rhin., und ihre Grenz., 1913, vol. vi, Heft 1, p. 27.

<sup>2</sup> Archiv für Laryn. und Rhin., 1912, vol. xxvi, Heft 2, p. 509.

in most cases *gradual dilatation* with some form of tube which is left inside of the larynx gives the best results. D. L. Richardson<sup>1</sup> introduces his tube by direct vision through the laryngoscope, as suggested by Mosher. He does a tracheotomy, and then dilates intermittently until the larynx is almost normal in size, and repeats this dilatation whenever any sign of the stenosis develops.

Lynah<sup>2</sup> has made a clinical and pathological study of the stenotic conditions of the larynx, which follow diphtheria. He believes that deformities of the larynx following diphtheria are largely due to the pressure ulcers. In cases of diphtheria, where the exudate in the larynx does not resolve quickly and necessitates the retention of the intubation tube, it is very likely that the tube, on account of the pressure exerted on the unhealed ulcers, leads to extensive necrotic lesions. He found that the pressure ulcers were most marked in the region of the cricoid cartilage, and were sometimes of such extent as to cause necrosis, with absorption of the whole of the cricoid ring. It is in these cases that persistent auto-extubation becomes so troublesome. The necrosis of the cartilage is followed by a productive inflammation which leads to the formation of new connective tissue, sometimes obliterating the lumen of the larynx; later, this connective tissue shows a tendency to become ossified so that the once cartilaginous cricoid is replaced by bone. Similar changes can occur, though rare, in the thyroid cartilage. In the treatment of stenosis of the larynx, Lynah uses gradual dilatation with retention tubes. In certain cases, the ordinary intubation tube has a tendency to become coughed out and for these cases he has constructed a special tube, the neck of which is extended, has a small diameter, and terminates in a bulbous portion which rests, when the tube is in place, well down in the trachea. These special tubes must be changed every four days at least, as longer retention makes it almost impossible to withdraw the bulbous portion through the contracting scar tissue.

*Chronic Hypertrophic Laryngitis* is a distinct pathological condition and is especially prone to affect the subglottic region. In advancing this belief, Homer Deputy<sup>3</sup> admits that in its inception the condition originates from a local destructive inflammation, diphtheria being one of the most common. Deputy is a believer in long-continued *dilatation by means of intubation tubes*. He, however, uses a larger tube and one that is somewhat longer than the ordinary O'Dwyer intubation tube. It also has a low retaining bulge and a wide head.

One of the most difficult types of *laryngeal stenosis* to properly treat is that *caused by the approximation of the vocal cords* where the arytenoid cartilages have for some reason been fixed in the median position. The

<sup>1</sup> Boston Medical and Surgical Journal, May 15, 1913, p. 749.

<sup>2</sup> Ibid., May 22, 1913, p. 753.

<sup>3</sup> Southern Medical Journal, March, 1913, vol. vi, p. 194.

suggestion of Alexander Iwanoff<sup>1</sup> to submit such cases to the *radical removal of one or both of the arytenoid cartilages* is of interest, especially in demonstrating the advance that has been made in modern surgical technique. The operation is done under general narcosis with the head hanging down over the table. An extensive laryngo-fissure is made, according to the usual method, but, in order to easily reach the posterior wall of the larynx, the incision is extended upward into the lower portion of the hyothyroid membrane and downward to include one or two rings of the trachea. To obtain a bloodless field, a 1 per cent. cocaine-adrenalin solution is injected into the posterior wall of the larynx. After ischemia is produced, an incision is made through the mucous membrane of the posterior wall directly in the middle line, and extending from the middle of the basal plate of the cricoid up to the top of the interarytenoid fold. Over the cricoid cartilage the incision is carried downward through the perichondrium, but above, that is, between the two arytenoids, care must be taken so that the incision does not penetrate the mucous membrane on the posterior side of the larynx in the hypopharynx.

The most difficult part of the operation is the separation of the perichondrium from the anterior face of the arytenoid cartilage. This is done most easily by first elevating the perichondrium from the anterior face of the cricoid, and then carrying the raspatorium close to the cartilage upward, passing over the articulation of the arytenoid with the cricoid and up on to the anterior surface of the arytenoid cartilage itself. The separation of the perichondrium from the processes vocalis and muscularis is so difficult that it is generally best to cut these processes off with a small pair of curved scissors. After the anterior surface is freed, the posterior surface of the arytenoid is next attacked, and here the perichondrium is raised fairly easily. The arytenoid is then detached from the cricoid by a raspatorium and luxated out of its position. It is generally necessary to cut off the upper extremity of the cartilage before it can be removed from the wound. After the removal of the arytenoid, a cavity remains, into which is placed a small strip of gauze. The lumen of the larynx is then loosely packed with gauze, and a cannula placed in the trachea.

Iwanoff has carried out this operation on one patient, a man, on account of fixation of both arytenoid cartilages probably the result of a specific lesion. At the time of the operation his voice was clear, but when the tracheal tube was stopped with the finger, expiration was very difficult and inspiration impossible. The patient stood the operation well, and the wound healed very quickly, although there was considerable swelling of the mucous membrane on the inside of the larynx. One and a half months after the operation,

<sup>1</sup> Zeitschrift für Laryngologie, Rhinologie, und ihre Grenzgebiete, 1913, vol. v, Heft 6, p. 1067.



both vocal cords were normal in color and the swelling on the inside of the larynx had disappeared. It was, however, still impossible for the patient to give up the tracheotomy tube. Iwanoff, on account of a desire to free the patient from obstruction as soon as possible, removed, intralaryngeally, the edge of one of the vocal cords, and three weeks after this operation the patient was able to permanently leave out the tracheal cannula. The final result was that the patient could breathe freely even during forced respiration following exercise, could cough, and had a fairly loud, deep, but somewhat hoarse, voice. The laryngoscope showed that the right arytenoid region appeared a little thicker than the left, but otherwise indistinguishable. There was some movement to the right arytenoid but not so much as normal, though the glottic chink was fairly wide. The right vocal cord was thick and rounded. Iwanoff claims that this is the first\* time that such an operation has ever been attempted.

It does not seem as though the final good result obtained in this case was due to the removal of the arytenoid cartilage but rather to the subsequent partial resection of the vocal cord. The chief interest lies in the demonstration of tolerance of the larynx to operative work when done under modern surgical technique.

**LARYNGEAL TUBERCULOSIS.** The advantages of *iodine in the treatment of tuberculous ulcerations* has long been recognized, and many attempts have been made by pharmacists to develop some drug which because of its peculiar chemical composition, would permit the iodine to come in contact with the diseased tissue without irritation. Ohmacht<sup>1</sup> reports on his experience with *Ulsanin*. Ulsanin is hydroiodoborate, and is described by Mandls in the *Deutschen medizinischen Wochenschrift*, Heft 51, 1912. It is a yellow powder, extremely hygroscopic, and to be preserved must be protected from any dampness. The least moisture is sufficient to make this powder turn an intensive brown color. liberating nascent iodine. It has been used for the disinfecting and healing of wounds, and also for its specific action in tuberculosis. It is also adaptable as an hemostatic in large bleeding surfaces, especially those following operations on the mucous membranes. When applied to the wound, it forms a slight eschar which acts as a protective covering to the wound. This eschar seems to be strongly germicidal. In laryngeal tuberculosis, Ohmacht has found that its action in ulcerative cases is very good. In pure infiltrations, it apparently has no influence, but, where the infiltration is accompanied with ulceration, he has found that after the ulcer has healed the infiltration shows a tendency to decrease in its extent.

Among the various *surgical procedures* which have for their aim the cure of laryngeal tuberculosis, *galvanocauterization* is probably receive-

<sup>1</sup> Monatsschrift für Ohrenheilkunde und Rhinologie, 1913, vol. xlvii, Heft 2, p. 296.

ing more endorsements than any other method. Levy,<sup>1</sup> in a very excellent article on laryngeal tuberculosis, says that, of the various modifications of surgical procedure, the use of the galvanocautery seems to have, at the present time, the most advocates.

R. Pettit<sup>2</sup> claims that he has healed from 70 to 85 per cent. of incipient cases of laryngeal tuberculosis by the submucous cauterization of the diseased tissue. When properly used, he says that the only dangers of the method are the infliction of burns on structures extrinsic to the larynx, the possibility of acute edema and perichondritis. These can be avoided by the observance of one or two cautions; the cautery must not be too hot, the puncture must not be too deep: and not more than two separate punctures should be made at one sitting, also, care must be taken not to penetrate the capsule of the cricoarytenoid joint.

My own experience with the electric cautery in laryngeal tuberculosis has led me to almost discontinue any other method of treatment. The only cases in which I have seen it do harm are in cases of severe, deep ulceration involving the musculature of the pharynx, especially when the vitality of the patient was low and healing slow. Cauterization of the muscles used in swallowing makes the act extremely painful, and it sometimes becomes almost impossible for a patient to obtain the proper amount of nourishment. I have never seen any edema, either intrinsic or extrinsic to the larynx, following the use of the cautery.

Arnoldson<sup>3</sup> writes out of a rich experience of tuberculous laryngitis, based on something like 600 cases. In the present article, however, he records only 34 of these cases, some of them in considerable detail. He says that local medicinal treatment has little influence on the course of the disease, and that endolaryngeal surgery, in the great majority of cases, is not dangerous, producing neither wound infection nor aspiration pneumonia, or any bleeding that is of serious consequence. The most instructive part of the article, however, is concerned with the results which follow the *surgical removal of the vocal cords*. He says that, even after the removal of a large part of the vocal cord, the voice may become quite good after the wound has healed. The excision of the vocal cord is indicated in cases of tuberculoma or where the infiltration involves the whole cord, provided that the arytenoid cartilage is movable or that there are no deep or advanced changes in other parts of the larynx. He states that there is no reason why, in proper cases, an infiltrated cord cannot be excised, even when there are multiple centres of disease, especially so if the other cord happens to be normal. The removal of the cord, however, is contra-indicated where there is marked extension of the infiltration to the subglottic mucous membrane, and where the disease is running a rapid course. While in the large majority

<sup>1</sup> Journal of the American Medical Association, May 17, 1913, p. 1519.

<sup>2</sup> New York Medical Journal, January 18, 1913.

<sup>3</sup> Archiv für Laryngologie und Rhinologie, 1913, vol. xxvii, Heft 1, p. 1.

of cases the removal of the vocal cord does not produce aphonia, the operation must be considered simply in the light of a therapeutic measure to eradicate a serious disease, and there is no guarantee that after the operation there shall be any improvement in the vocal function.

Although I have not had any actual experience in the surgical removal of one of the vocal cords, it seems to me that such procedure must be accompanied by serious disturbances in phonation. My own feeling is that tuberculous lesions of the vocal cord can be more properly dealt with by the judicious use of the galvanocautery, as it is especially in lesions involving important structure that the galvanocautery is of particular value. The influence of the cauterization acts beyond the actual area of destruction, this being due to the inflammatory reaction which brings new bloodvessels to the devitalized part.

*For the relief of pain in laryngeal tuberculosis*, there is nothing that is so effective as the *destruction of the function of the superior laryngeal nerve*. The popularity of this method of treatment is shown by numerous articles that have appeared during the past year. Wm. Mithoefer<sup>1</sup> employs 80 per cent. *alcohol* which has been previously warmed, and injects fifteen to thirty drops at one sitting. For the purpose of determining the exact position of the superior laryngeal nerve, he calls attention to a painful spot which is easily found at a point on the outer edge on the hypothyroid membrane where the internal branch of the superior laryngeal nerve enters the larynx. Pain on pressure over this area is the chief indication for the use of the alcoholic injection. He uses a special needle which has a shoulder to prevent too deep penetration. The thumb presses the larynx toward the side of the painful spot, and the needle enters the skin over this spot to the extent of  $1\frac{1}{2}$  cm. The direction of the needle is then turned upward and outward toward the ear. If there is severe burning pain radiating toward the ear, he is certain that the nerve has been reached. Mithoefer has not had any untoward symptoms, and the period of absence of pain after an injection was from five to forty days. He says that the painful spot, found at the entrance of the superior laryngeal nerve into the larynx, is always present in cases of tuberculous laryngitis.

From a careful anatomical study of the position of the internal nerve, Edward D. Davis<sup>2</sup> says that the most accurate surface-marking is a spot midway between the hyoid bone and the upper border of the thyroid cartilage, immediately above the superior thyroid tubercle. In most persons the superior thyroid tubercle is easily palpated, and particularly so in the thin, tuberculous patients. Sometimes, however, the nerve pursues an abnormal course. Davis makes use of the tender spot which can be found immediately above the superior thyroid tubercle. The needle is introduced to a depth of  $1\frac{1}{2}$  c.c., and the point care-

<sup>1</sup> Ohio State Medical Journal, July, 1913, p. 315.

<sup>2</sup> The Lancet, October 18, 1913, p. 1111.



fully moved about so as to seek the spot at which the patient complains of pain in the ear. He injects about 1 to 2 c.c. of a slightly warmed alcoholic solution. In twelve cases no disagreeable symptoms developed, in fact, he says that the proceeding is not much more difficult than the usual hypodermic injections.

Gignoux<sup>1</sup> advises the *resection of the internal branch of the superior laryngeal nerve*. The operation is done under local anesthesia. An incision about 4 cm. in length is made in a horizontal direction, starting 1 cm. in front of the anterior edge of the sternomastoid muscle and running to about 1 cm. from the middle line of the front of the neck. The internal branch of the superior laryngeal nerve is found about midway between the hyoid bone and the upper edge of the thyroid cartilage. In making the dissection, it is necessary to avoid the region near the lateral wing of the thyroid cartilage on account of the possibility of injuring the external branch of the superior laryngeal nerve. If necessary, the operation may be carried out on both sides at one sitting. The only inconvenience felt by the patient is occasionally the sense of a foreign body in the throat.

In the large majority of cases, I do not believe that the resection of the laryngeal nerve is ever indicated because the blocking of the nerve with alcohol or cocaine accomplishes the same purpose, is much more simple in its performance, and the return of function of the laryngeal nerve may be a very desirable happening in these days of the use of the electric cautery.

**CARCINOMA OF THE LARYNX.** Our present knowledge concerning the clinical aspects of laryngeal carcinoma is very well summarized in any article by Crile.<sup>2</sup> He believes that it has now been demonstrated that intrinsic laryngeal cancer very seldom, if ever, invades hyaline cartilage, and that the cervical lymphatics are involved only late in the disease. It frequently follows in the wake of benign tumors and chronic ulceration. The immediate mortality following the operation is well controlled, and the disability and deformity of the laryngectomized patients is not important enough to have any weight in deciding for or against the operation. The technique can be completely mastered, so that, if early recognized, intrinsic cancer of the larynx is probably the most curable form of this disease in the whole body. The danger of mediastinal abscess following laryngectomy can be practically eliminated by the doing of a preliminary tracheotomy, with packing of the deep planes of the neck with iodoform gauze. At the second operation the trachea cannula is removed, and a well-fitting rubber tube, a foot or more long, is carefully slipped into the trachea. The tubing should be slightly larger than the trachea in order to make a fluid-tight joint.

Crile uses local anesthesia in connection with the general narcosis in order to allay the excitation of special reflexes of the superior laryngeal

<sup>1</sup> *Le Larynx*, March, 1913.

<sup>2</sup> *The Laryngoscope*, vol. xxii, p. 1317.

nerve. To give sufficient room for an easy dissection, the incision should be T-shaped with the transverse cut over the position of the hyoid bone. The removal of the larynx is begun by cutting through the upper part of the trachea or, maybe, the cricoid cartilage, great care being exercised not to injure the esophagus. The lower portion of the larynx is then pulled outward and upward, and gradually separated from the esophageal wall, the dissection being so carried out as to leave the blood-vessels which supply the larynx to the very last. The tracheal opening may be either brought forward and stitched to the skin around its whole lumen, or merely attached by its anterior flap. The pharyngeal opening should be closed, and, if possible, reinforced by drawing the soft parts together over the line of suture. The rest of the entire wound should be left open and packed lightly with iodoform gauze.

As to the *possibilities of cure* following surgical attacks upon laryngeal cancer or carcinoma, the publication of G. Gluck<sup>1</sup> has some very interesting statistics. In his 160 cases of removal of the entire larynx, he has had no mortality in the last series of 63 cases. In the 132 operated on before 1911, 24 patients were free from recurrence for from four to fifteen months, and 21 others for three years. In 48 cases of semi-laryngectomy there were 3 deaths in the first 28 cases and none in the last 20 cases. In 42 cases of laryngo-fissure for carcinoma, there was no mortality in the last 35. In the cases of laryngo-fissure the functional results are sometimes surprisingly good, and in one of his patients, a man, aged forty-seven years, a new vocal cord had developed and the man can speak without effort.

Concerning the *possibility of obtaining audible speech* after complete removal of the larynx, Edward W. Scripture<sup>2</sup> reports a very interesting case of a patient who had had his larynx removed for carcinoma and breathed through a tracheal cannula. He was scientifically taught the mechanism of each vowel and consonant. The patient found the work so interesting and carried it out so successfully that he developed speech which could be heard distinctly through two large rooms.

**Endoscopy.** A very complete summary of recent progress in endoscopy is that by Jackson.<sup>3</sup> This article, which covers the whole subject of endoscopy, is very concise and extremely instructive, especially so as he gives many little tricks of technique which have been of actual value to himself. Most of the improvement and ideas reviewed in this article have been published in previous communications by different authors, and the work is mentioned here simply to bring it to the attention of those who desire the latest thought on endoscopy in an instructive and abbreviated form. The author believes that every laryngologist should be able to examine the larynx of every child by the direct

<sup>1</sup> Berlin. klin. Wochensch., May 26, 1913, vol. 1, No. 21.

<sup>2</sup> Journal of the American Medical Association, May 24, 1913, p. 1601.

<sup>3</sup> The Laryngoscope, July, 1913, p. 721.

method without any anesthesia, general or local, because he says direct laryngoscopy is the only way in which the very young child's larynx can be examined. He believes that anyone who will, by continued practice, keep himself in training may do good work and contribute to the future progress of endoscopy.

Jackson, however, does not even mention suspension laryngoscopy in this article, and we must turn to others for information of any advantages which the past year has shown for this method of inspecting the upper respiratory tract.

Killian's *suspension laryngoscope*, which was introduced a little over a year ago, has not yet received the endorsement necessary to give it a very wide range of use. Wolff Freudenthal<sup>1</sup> has probably had as much experience with this instrument as anyone else in the country. He uses Albrecht's modification of the original Killian instrument. Before introducing the instrument, he cocainizes the base of the tongue, the pharynx, the epiglottis, and the interior of the larynx with a 20 per cent. solution. The patient is then placed on his back on an operating table with his shoulders at the edge of the table and a nurse holding his head. From here on, he differs somewhat with Killian in his method of introduction. Being seated, he passes the spatula back into the pharynx, and an assistant adjusts the gallows to which the tongue spatula is then hooked. After this, the final adjustment of the apparatus is completed. The introduction of the spatula is somewhat more difficult under general anesthesia. A gag is introduced into the right corner of the mouth and the tongue slightly withdrawn. After the spatula is once adjusted, the mouth gag is removed. Freudenthal found, however, that the majority of cases could be operated on under local anesthesia. At first he had trouble in keeping the epiglottis from slipping from beneath the end of the spatula, and had to modify the spatula by attaching a loop-like prolongation. He says that the chief advantage of the suspension laryngoscope is that it gives an excellent view of the interior of the larynx, trachea, the sinus pyramidalis, the pharynx, and occasionally the upper part of the esophagus, and that, in operating, the surgeon can use both hands and has much more room to do his work than in the ordinary method of direct laryngoscopy.

Samuel Iglauer<sup>2</sup> says that one of the advantages of suspension laryngoscopy is that the part under examination may be viewed directly and from many angles, so that there is a certain plasticity and perspective obtained which is wanting under any other method. Iglauer also calls attention to the fact that, contrary to what might be expected, the suspension is borne by the patient without much discomfort and may be continued for a considerable length of time.

<sup>1</sup> New York Medical Record, February, 1913, vol. lxxxiii, No. 1, p. 329.

<sup>2</sup> The Laryngoscope, June, 1913, p. 3.



While for certain operations on the larynx, the hypopharynx, and upper part of the esophagus the suspension laryngoscope offers distinct advantages over all other methods, it has not yet been shown that this method is likely to supersede the older forms of endoscopy.

A new principle has been introduced into our methods of examining the esophagus and stomach by Richard Lewisohn.<sup>1</sup> He believes that the ordinary straight *esophagoscope* is, to say the least, extremely uncomfortable for the patient and is at times also a rather dangerous instrument. Its use has been followed by a large proportion of perforations of the esophagus which have resulted fatally. It must be remembered, in this connection, that the esophagus cannot be put into a straight line, even by extreme flexion of the head, so that in the introduction of a straight instrument force must be applied against the posterior wall which may be sufficient to crush it against the spinal column. He further says that a satisfactory esophagoscope should fulfill three main requirements: (1) the introduction must be possible in the normal position of the head; (2) the instrument must be so constructed that when pushed downward it passes in the direction of the longitudinal axis of the esophagus and not at angle to its axis; (3) the esophagoscope should only be passed downward through the esophagus under direct vision.

Lewisohn has endeavored to construct an instrument which will accomplish these purposes. This instrument consists of two portions which are joined together at almost a right angle, first a horizontal portion which lies in the mouth of the patient during the examination, and, second, a vertical portion consisting of a telescope composed of six separate tubes which can be pushed down into the esophagus as far as necessary. The source of the light is external, and is a very strong one. The light is reflected down the longitudinal portion by a mirror set at an angle where the two portions join. The telescope consists of six steel tubes which can be separated for cleaning, and are operated by a spring which is attached to the upper part of the lowest tube and runs within the lumen of the telescope up to a canal on the under side of the horizontal portion and through this to an exit just above the handle of the instrument. The extended tube is 33 cm. in length, and the horizontal portion 10 cm. The instrument can only be used for diagnostic work, but its ease of introduction makes it ideal for this purpose.

Hermann Marschik<sup>2</sup> advises *internal esophagotomy for the treatment of cicatricial stenoses of the esophagus*. He is partial to Lerche's instruments, because they are so made that pressure on a trigger on the handle will cause the knife to bend toward the wall of the esophagus in such

<sup>1</sup> Annals of Surgery, 1913, vol. lvii, p. 28.

<sup>2</sup> Monatsschrift für Ohren. und Laryngo-Rhinologie, 1913, vol. xlvii, Heft 2, p. 179.

a manner that it can be made to cut in any desirable direction. In operating, the incisions should only be made through scar tissue which can be recognized by its white color and apparently fibrous nature. When the cicatrix is circular, four cuts should be made an equal distance from each other. When the stenosis is excentric, the incisions should be limited to that part of the wall which seems to be the thickest and shows the most scar tissue. It is absolutely essential that the incisions be made under control of the eye. When the stenoses are multiple, only the upper one should be dealt with at the first operation. After the cicatrix has been incised, a conical bougie is introduced and kept in place for about ten to fifteen minutes, the purpose of which is to prevent the immediate union of the walls of the incision. The patient is kept quietly in bed for a week and only fluid food given through the esophagus. If the patient has had a gastric fistula made, all food should be given through that and not through the mouth. At the end of a week, progressive dilatations with conical bougies may be started. If another operation is necessary on account of multiple strictures, ten weeks must elapse between the operations. Up to 1910, he has treated 11 cases by internal esophagotomy, and in only 2 were the results negative, the others showed marked improvement, so that they were able to swallow firm, solid food, such as meat. The chief advantages of the cutting operation over gradual dilatation is the decrease in the amount of time required by treatment. Marschik does not believe that this method of performing esophagotomy is particularly dangerous, although in three of his cases there was some evidence of a peri-esophagitis and one woman, aged forty years, had high fever and pleurisy which made it necessary to keep her in bed for a week or more longer than usual.

The use of the *bronchoscope in the treatment of diseases of the trachea and bronchi* has advanced beyond the stages of experimentalism and is gradually becoming one of our routine measures. Heilskov and Mahler<sup>1</sup> report 30 cases of *bronchitis* and *asthma treated by the local application of novocain and adrenalin*. In 28, out of 30 cases, the applications were made through the bronchoscope by means of a Brunning's spray. About 120 applications were made in these 30 cases, and not once were any disagreeable symptoms produced, such as poisoning from the drug. Three of the cases were chronic bronchitis, and 27 were bronchial asthma. Patients received individually from two to eleven treatments. Six of these cases were completely cured, and eleven showed marked improvement.

When we consider that all of these cases had been previously treated by the older methods without any benefit, these results are very encouraging as to the possibility for cure by direct applications.

<sup>1</sup> Monatschrift für Otologie und Laryngo-Rhinologie, 1913, Heft 1, vol. xlvii, p. 67.

Large<sup>1</sup> reports a case of asthma which had resisted all of the older forms of treatment, including operations on the nose and throat, and was finally cured by means of bronchoscopy. As to the discussion of the merits of bronchoscopy in asthma, Large disclaims any intention of desiring to convey the impression that the bronchoscope should be passed in every case of asthma, but simply that it represents a hope for cases that have not yielded to other forms of treatment.

<sup>1</sup> Cleveland Medical Journal, June, 1913, vol. xii.



# OTOLOGY.

By ARTHUR B. DUEL, M D.

THE Seventeenth Annual Meeting of the International Congress of Medicine in London this year called forth an historical review of otology, with special reference to the work of our British confrères. In the midst of the busy rush of modern practice it is well to pause on certain occasions for a moment of retrospect, in order to maintain our orientation, so to speak, with reference to our special department of medicine and surgery. When we reflect, as Yearsley<sup>1</sup> has pointed out, that until the seventeenth century, and indeed, it may be said, until the nineteenth century, otology was a very empirical matter, having scarcely passed out of the domain of quackery, we come to realize the importance of the work which, as specialists, we have accomplished within the last half century. Yearsley especially calls this to mind by quoting from Sir William Wilde the statement, made in 1853, that "the affections of the ear, whether functional or organic, are spoken of, lectured on, written of, and described (even in great part to the present day), not according to the laws of pathology which regulate other diseases, but by a single symptom, that of deafness."

When this statement is viewed in the light of present-day teaching and experience, we feel that we may be justly proud of what has been accomplished by modern otologists. Year by year the major surgery which concerns the ear has, as we know, been taken more and more completely out of the hands of the general surgeon, and has come to form a part of otological practice. Year by year, too, the archives of otology have been more and more richly filled with valuable records of experience.

The last twelve months have left their impress upon the world of otology by reports of progress along previously proposed paths, rather than by the blazing of new trails. The literature shows the average number of text-books, monographs, and papers, covering a creditable amount of excellent work, but, so far as the reviewer has been able to see, no epoch-making contributions have made their appearance.

In certain directions there has been a perceptible falling off of interest, if one may judge by the relative number of articles published within the year. This may be taken to mean the assumption of a

<sup>1</sup> Journal of Laryngology, Rhinology, and Otology, August, 1913, p. 395.

more conservative attitude on the part of otologists, a preservation of the scientific attitude of "suspended judgment pending proof," rather than a flagging of interest.

**Vaccines, Sera, etc.** This applies more directly, perhaps, to the *use of vaccines, sera, and allied products* than to any other phase of otological work. The bug-bear, "anaphylaxis," has waved a menacing hand, and many have tended to halt. At a recent meeting of a body of otologists, a protest was registered by some of those present against the putting upon the record of experiences along this line until, by an accumulation of evidence, it may be felt that opinion, negative or positive, may be safely expressed. For, as it was contended, general practitioners, and inexperienced specialists, reading reports of favorable results with sera, vaccines, etc., may be led to employ these agents to the exclusion of operative procedure in many cases in which failure to institute prompt surgical interference may prove disastrous and even fatal. For this reason, it is advocated that such reports be withheld from publication, however free their discussion may be *in camera*, until the true value of these remedial agents shall have been more thoroughly established. It goes without saying that not even the most conservative advocate the abandonment of these measures when, for any reason, their use is indicated, but it is equally certain that discretion is the better part of valor in their administration, and that silence may be golden in the matter of reporting results.

J. Lang,<sup>1</sup> in a contribution entitled "Antistreptococcus Serum and Electrargol in the Treatment of Septic General Infections of Otogenic Origin," reports 3 cases of otogenic pyemia, which were treated with Aronson's antistreptococcus serum, with one recovery; and 9 cases of otogenic pyemia, which were treated with electrargol, six of the patients recovering.

**Meningitis.** The most conspicuous work of 1912 in otology, as I stated in the review of otological literature for that year, were the contributions of Kopetzky, concerning the bearing of certain tissue reactions upon the early diagnosis of otitic meningitis, and of Haynes, on the surgical treatment of the disease by drainage of the cisterna magna. This furnishes one of the conspicuous examples of the "report of progress" which has characterized the otological literature of 1913.

Kopetzky<sup>2</sup> has confirmed his previous findings by another contribution on the subject of the tissue reactions as aids in the early diagnosis of purulent meningitis. The cerebrospinal fluid in cases of meningitis, as well as in other cases with bulbar symptoms and increased brain pressure, presents a variable acidity instead of the normal alkaline or amphoteric reaction. This produces softening of the colloids and thereby leads to edema of the brain and the meninges, the edema being

<sup>1</sup> Archiv für Ohrenheilkunde, 1913, vol. xc, p. 252.

<sup>2</sup> Zeitschrift für Ohrenheilkunde, 1913, vol. lxxviii, p. 1.

still further increased through the impairment of the supply of oxygen. Even before the presence of the microbes can be demonstrated in the cerebrospinal fluid, the otherwise present dextrorotatory reducing substance disappears, reappearing again with the subsidence of the infection. The only exception from this rule, according to Kopetzky, is represented by gradually developing tuberculous inflammations of the meninges. The symptoms of intoxication, in the clinical picture, are probably essentially due to the presence of cholin, a split product of lecithin. The relief of the brain pressure is the primary therapeutic consideration.

According to Haynes, this purpose is best accomplished by drainage of the cisterna magna. The experience which has accumulated since the first presentation of this method, before the American Laryngological, Rhinological, and Otological Society, in 1912, has not been sufficient to induce uniformity of opinion concerning its efficacy.

Dench<sup>1</sup> reported 3 cases, each one terminating fatally, in which the Haynes operation was performed. One of the cases, a simple otitis meningitis following chronic middle-ear suppuration, should have proved an ideal case for the procedure, but the operation merely resulted in prolongation of life. He expressed the belief that the method should be given a thorough trial, despite the unfavorable results reported in the majority of cases.

Milligan<sup>2</sup> adds 2 cases to the list, in each of which the patient died. In both cases, he believed, the operation was undertaken too late. The procedure, however, appealed to him, and he expressed the hope that at some future time he might undertake it in a much earlier stage of the disease.

Wilson,<sup>3</sup> who considers the Haynes method the most perfect technique for purulent meningitis, reports two fatal cases in which this operation was performed. In two of the four cases of meningitis cited, he found, upon examination, that the cerebrospinal fluid contained a copper-reducing body, although it must be noted that the tests were made late and not early in the course of the disease, and that it has been previously observed that the early disappearance of this body may be followed by its later reappearance. He inclines to the belief expressed by Kopetzky that the disappearance of this copper-reducing substance, which is normally present, is one of the earliest and most reliable signs of meningitis; the diagnostic limitations of this observation must, however, be fixed by further investigations.

I have employed the Haynes operation in 3 cases, all of which terminated fatally. In no case was there any benefit from the operation. However, I still consider this a rational method of procedure, holding out greater hope for this condition than any other method now in use.

<sup>1</sup> *The Laryngoscope*, September, 1913.

<sup>2</sup> *Journal of Laryngology, Rhinology, and Otology*, May, 1913.

<sup>3</sup> *The Physician and Surgeon*, June, 1913.



I believe, with others, that it should not be abandoned because of unfavorable reports, but should be continued to be employed until its status has been thoroughly established.

The great hope which the work of Kopetzky and Haynes held out was the possibility, by means of the reactions of the cerebrospinal fluid, of making a diagnosis of meningitis in time to institute some operative measure which would drain the meninges efficiently before the infection had become so extensive as to overwhelm the patient.

My belief is that when any operative interference accomplishes relief in purulent meningitis the case is one of *localized* infection. The spread of the infective process throughout the entire calvarium renders unsuccessful any operative procedure. As it becomes more and more possible, as a result of early diagnosis, and through early surgical interventions, to limit the extension of the infection, better and better results will be obtained and a larger proportion of successful cases will be reported. The difficulty in the past has been that the patient is overwhelmed before the diagnosis is made. In other words, the disease manifests itself by clinical symptoms after it is too extensive for the successful performance of any operation. If, by any delicate test, such as Kopetzky has evolved, sufficient evidence of meningitis can be obtained while the process is still localized, it will then become possible, at the very beginning, to limit the area of infection, and thus save the patient's life.

Up to the present moment, there have been no cases reported in which the Haynes operation has been successful with respect to saving life. Work of the character of that accomplished by Kopetzky and Haynes, however, should certainly be encouraged.

It is reasonable to believe that a localized infection may, with properly evolved tests, give as conclusive evidence of the presence and activity of the meningococcus as does a generalized infection, and it is just this which gives hope for the future complete mastery of acute purulent meningitis.

Concerning the CURABILITY OF OTOGENIC MENINGITIS, Kotz<sup>1</sup> reports the recoveries from meningitis after cholesteatoma-suppurative labyrinthitis. In all these cases, incision of the dura was omitted, and only the primary focus was removed. On the basis of his experience, the author emphasizes the importance of making an attempt to save the patient through operative removal of the primary suppurating focus, in all cases, including those with the undoubted clinical picture of meningitis. The presence of pus or bacteria in the puncture fluid is not a contra-indication against the performance of the operation; which should only be omitted in those extremely grave cases of meningitis in which any intervention appears hopeless on account of the somnolence, the complete rigidity at the nape of the neck, and the high fever.

<sup>1</sup> Münchener med. Wochenschrift, 1912, No. 52, p. 2863.

THE OCCURRENCE OF MENINGOCOCCI IN THE PUS OF THE EAR is discussed by Doering,<sup>1</sup> on the basis of 2 cases which came under observation in the Halle ear clinics. The ear-pus was found to contain intracellular meningococci, although the symptoms of epidemic cerebrospinal meningitis were absent. The germs were also found in the spinal puncture fluid of a child who had succumbed to sepsis and meningitis, after the radical and labyrinth operation.

THE MODE OF ORIGIN OF THE DEAFNESS, IN TYPICAL CASES OF CEREBROSPINAL MENINGITIS, is as yet imperfectly understood. Gradenigo<sup>2</sup> was enabled to show that the infection is distributed by way of the meninges through the internal auditory meatus, with rupture into the labyrinth. In those cases in which the fundamental disease lasts only a few days, and is accompanied by otitis media, with a final outcome in bilateral deafness, the origin of the loss of hearing is not readily accounted for. In the abortive forms of cerebrospinal meningitis, in which the infection originates from the pharynx, the possibility must be admitted that the infection reaches the middle ear by way of the tube, penetrating from here into the labyrinth.

The contribution is based upon the author's observation of three clinical cases of cerebrospinal meningitis terminating in deafness. It has always seemed to me that deafness in these cases is due to inflammation of the labyrinth rather than to a central lesion. The study of more cases will be necessary to substantiate this idea.

**Syphilis of the Ear and its Treatment with Salvarsan.** In last year's PROGRESSIVE MEDICINE I reiterated the views expressed by Citelli, to the effect that the neuro-recurrences which apparently follow the use of salvarsan are due to remaining spirochetes rather than to the toxic effects of the drug. It may be recalled that Gelle, among others, assumed the position that these complications are due to the toxic action of the salvarsan, and that the advocated further "606" medication had not proved successful in his experience.

This difference of opinion regarding these neuro-recurrences continues to appear in the otological literature concerning syphilis and its treatment by salvarsan. Rimini,<sup>3</sup> for example, reports 8 cases of severe disturbance of the acoustic nerve after salvarsan injections. He most urgently cautions against this method of treatment in all syphilitic patients whose ears are affected in even the slightest form; meaning those syphilitic individuals who present disturbances of the auditory organ which have nothing in common with the syphilis and which have existed for a considerable time prior to the specific infection. In other words, the warning against indiscriminate use of salvarsan concerns the syphilitic patients who are suffering from chronic middle-ear

<sup>1</sup> Münchener med. Wochenschrift, 1912, No. 36, p. 1955.

<sup>2</sup> Archivio Italiano di Otologia, 1913, vol. xxiv.

<sup>3</sup> Deutsch. med. Wochenschrift, 1913, No. 2, p. 71.

catarrh, otosclerosis, or so-called nervous aural tinnitus. Experience teaches that the salvarsan treatment in these cases may be followed by grave incurable affections of the auditory organ, which not only interfere with the patient's enjoyment of life but also with his earning capacity.

Lang<sup>1</sup> reports variable results, in part beneficial, with *salvarsan and pilocarpin*, in some cases of congenital syphilitic disease of the auditory organ. Pilocarpin was tried in two cases, both times unsuccessfully. In one case the pilocarpin was not tried until after the salvarsan had proved inefficient. The salvarsan injections were applied into the gluteal muscles in all cases, five in number. In one case, no improvement was obtained; three patients were improved, but in one of these improved cases a recurrence followed, and in another case the transitory improvement was suddenly replaced by a considerable change for the worse in the hearing.

Five cases of evidently syphilitic inflammation of the middle-ear, with simultaneous specific involvement of the internal ear, were observed by Luders,<sup>2</sup> who points out that this affection usually takes a practically painless course, in spite of severe inflammatory manifestations on the part of the tympanic membrane. Although antisymphilitic treatment has a favorable effect, there remains, as a rule, a nervous hardness of hearing, or deafness, in the affected ear in these cases. The internal ear is involved in all cases of syphilitic inflammation of the middle-ear. The process must be interpreted in such a way that the labyrinthine symptoms are manifested to a more or less marked degree, according to the extent and severity of the involvement of the individual segments of the labyrinth. The facial paresis, in one of the author's cases, was readily accounted for by the proximity of the canal of the facial nerve to the tympanic cavity, which takes its course in the facial canal, in consequence of the tympanic hyperemia, and pressure upon the facial nerve.

Probably the most important contribution of the year to the literature concerning the use of salvarsan in otology is that of Karl Thieme,<sup>3</sup> Assistant in Dozent, Dr. H. Frey's department for diseases of the ear in the Kaiser Franz Joseph Ambulatorium in Vienna.

After briefly reviewing the history of the Jarisch-Herxheimer reaction following the treatment of syphilis by mercury, Thieme calls attention to the numerous reports of disturbances immediately following the injection of salvarsan. There may appear disturbances of function or organs or parts of organs in which, up to that time, no morbid changes had been evident. The occurrence of "salvarsan

<sup>1</sup> Deutsch. med. Wochenschrift, 1913, No. 9, p. 409.

<sup>2</sup> Ibid., January, 1913, No. 5, p. 225.

<sup>3</sup> Journal of Laryngology, Rhinology, and Otology, May, 1913, vol. xxviii, No. 5.



injuries" affecting portions of the nervous system have led to a considerable discussion of the "neuropathic" action of salvarsan.

The application of these findings to otology, as Theimer recalls, was first made by Oskar Beck before the Austrian Otological Society in 1910. Four cases were detailed in which immediately, or very shortly after the injection of salvarsan, a symptom-complex appeared which corresponded to a unilateral complete paralysis of vestibular function, which after a time ended in complete restitution of function. Ehrlich expressed the opinion, at the time, that this unilateral paralysis of vestibular function is obviously analogous to the Jarisch-Herxheimer reaction. This view is still maintained by Ehrlich.

Theimer, in reviewing the literature of the subject, did not confine himself to a review of cases in which like those reported by Beck and Urbantschitsch, the vestibular nerve alone was affected, but he also collected cases in which both the cochlear and the vestibular nerves were attacked. This resumé was sufficient, in his opinion, to show that "the cases are characterized by the *rapid appearance of symptoms referable to the internal ear a very short time after the salvarsan injection, and by their equally rapid disappearance.*"

From the study of the subject, Theimer classifies the various injuries to the internal ear following the use of salvarsan, as follows:

1. Affections of the internal ear, of the vestibular or of the cochlear apparatus alone, or of both together, in patients who are already subjects of an aural lesion. In some of these cases the phenomena disappear in the course of time, some after repeated salvarsan treatment, some after mercurial treatment. In others, the lesions prove to be permanent.

2. Affections of one or both sections of the internal ear in persons whose ears have been previously proved to be normal. The phenomena appear a long time—weeks or months—after injection. Here, also, the symptoms may disappear after a time, or they may persist.

3. Affections of one or both sections of the internal ear in persons whose ears have been previously proved to be normal, appearing immediately or shortly after the injection. They persist for a long time, and may prove to be permanent.

4. *An affection of the internal ear, attacking by preference the vestibular apparatus solely, which appears immediately, or soon after the injection, and disappears as rapidly—at most within a few days—and so completely that the phenomena become absolutely normal again.*

Cases of Group 4 are the only ones which correspond to the Jarisch-Herxheimer reaction, this reaction having been shown to appear only in places where there are already syphilitic changes in existence. The conclusion is reached that in cases belonging to Group 4, syphilitic changes in the eighth cranial nerve must have previously existed. Were this not the case there would be no cause for the incidence of the

Jarisch-Herxheimer phenomena, and we would be compelled to consider these cases as due purely to the toxic action of the salvarsan. Such an assumption, in Theimer's opinion, has no support. With this view, as previously stated, I am in accord.

This author calls attention to the fact that, on the other hand, syphilitic changes, possibly of the nature of perineuritis, can exist in these nerves, of too slight a nature to cause subjective troubles or to be demonstrable by the methods of examination at our disposal. If, at the site of these lesions, a reaction is set up in consequence of the treatment by salvarsan, exceeding the original lesion in extent by reason of an increase in bulk of the diseased tissue, the sudden onset of the symptom-complex corresponding to unilateral complete paralysis of vestibular function would readily occur. Furthermore, the function of a nerve with the topographical anatomy of the eighth cranial, whose fibers pass through a narrow bony canal, is more readily impaired than that of nerves which traverse soft tissues. Theimer considers this explanation in keeping with the rapid subsidence of the symptoms and the return to the normal.

"Thus," continues the author, "*the only cases of injury to the internal ear after salvarsan which can be described as manifesting the Herxheimer reaction are those in which the phenomena appear shortly after the injection and rapidly disappear.* The disturbances affect the vestibular portion of the nerve for the most part, and, as a rule, induce the clinical appearances of a complete paralysis of the vestibular apparatus. At the same time, rapidly appearing and disappearing disturbance of the cochlear apparatus may also be included under this heading."

Attention is called to the findings of Leidler, Ruttin, Neumann, and Barany, that isolated paralysis of the vestibular nerve after salvarsan has recently been observed more frequently, while its occurrence from other causes has been but seldom observed.

The relationship between the cases described under Group 4, and those in Group 3 is a matter to be determined by further observation.

Theimer concludes with the statement that if the number of cases which may with certainty be looked upon as instances of the Jarisch-Herxheimer reaction in the neighborhood of the eighth cranial nerve is not yet very great in proportion to the cases of neuro-recurrence of that nerve, the reason is doubtless to be found in the fact that sufficient attention has not as yet been paid to this symptom-complex.

Kren<sup>1</sup> cites another case, in which the Herxheimer reaction in the ear is noted.

This suggests food for thought, and makes us realize that the last word has not been said with reference to salvarsan in the treatment of syphilis.

<sup>1</sup> Wien. klin. Wochenschrift, 1913.

**Otosclerosis.** In my discussion of this subject last year, I expressed the opinion that, in view of the work of Manasse, Siebenmann, and others, one feels no necessity for following the various etiological will-o'-the-wisps which from time to time flash across the otological horizon. I have found no reason, during the year just ended, to change this attitude. Despite the excellent work of these investigators, we still find in the literature evidences of the old-time pessimism regarding this condition, its cause and its treatment. Thus Sheppard<sup>1</sup> says:

"I know of but one positive statement that I can make concerning otosclerosis, without expecting to be contradicted, and that is, that there is a lesion of the temporal bone found at autopsy and by subsequent microscopic examination, which we may call otosclerosis, capsular labyrinthitis, osteitis, spongification, new-spongification, with or without exostosis or hyperostitis, osteomalacic capsular labyrinthitis, etc. As to the existence of such a lesion, there seems to be a general agreement."

In an article presented before the Forty-sixth Annual Meeting of the American Otological Society, held in Washington, May 6 and 7, 1913, Harris<sup>2</sup> presented some of the recent views concerning the disease, dwelling largely upon the work of Manasse, to which I have previously referred.

Harris points out the importance of the "microscopic examination of the temporal bones of those in whom the disease has been diagnosed during life, at the same time calling attention to the difficulty, especially in America, with which this material is obtained. The total number of cases investigated is small, and are almost entirely limited to those studied by German otologists.

In order to more properly consider the subject, the author gives a concise history of otosclerosis, which we take the liberty of quoting: "The number of investigators is few, and the total number of cases, microscopically studied, collected by Denker up to 1904, is limited. The term otosclerosis, as you are aware, was first used by Joseph Toynbee, in 1857, in his descriptive catalogue of 1149 specimens, where he described 126 cases of union of the stapes in the oval window. The term was used for many years to describe such an obstruction to the sound-waves whether of a membranous or bony nature. But it was not until 1885 that it was demonstrated macroscopically and physically by Bezold that the loss of hearing for low sounds was the result of such rigidity in the oval window. The first microscopic examination of a diseased temporal bone in a case of otosclerosis was made by Katz, in 1890. He was followed by Habermann, who, in 1892, reported his first case. In 1893, Bezold and Scheibe reported their first case, and in

<sup>1</sup> New York State Journal of Medicine, December, 1912.

<sup>2</sup> The Laryngoscope, August, 1913.



the same year, Politzer, in this country, and, if we are not mistaken, before this Society, reported 16 cases, all observed by him during life and studied histologically postmortem. In 1894, Bezold reported his second case; in 1898, Siebenmann reported 4 cases. In 1901, Scheibe reported 2 cases, in the same year Habermann reported ten temporal bones observed in six patients, a total of 34 cases. Since then Panse has reported 2 cases, Joergen Moeller 1 case, Bruehl 5 cases, Schilling 1 case, Otto Mayer 1 case, and most recently Manasse has described seventeen temporals in ten patients.

"The early view in regard to the etiology of the affection was that it proceeded from a disease of the middle ear. This is undoubtedly correct in the cases of Katz, in which, both from the history and clinical picture, a previous chronic suppuration of the middle ear was evident. In those of Scheibe, and of the 10 cases of Habermann, there is likewise a clear history of middle-ear disease. Politzer was the first one to advance the view, which he still maintains, that the disease is a primary affection of the labyrinthine capsule, originating not in the periosteum but in the bone itself. As a result, new bone tissue is developed which gradually presses out the old bone and advances to the oval window and the stapes, leading finally to a complete stapes ankylosis. Siebenmann was the first to make a careful study of the affection and he is of the opinion that the spongifying process does not proceed from the periosteum, nor yet does it develop as a primary affection of the bone. From the cases which he studied he is of the opinion that the starting-point is to be found on the border between the labyrinthine capsule, which is primarily developed out of cartilage, and the connective-tissue bone (*Bindegewebesknochen*) secondarily developed from the periosteum, and that the earliest stage of the disease is to be found in a lacunary resorption of the bone by means of the Haversian canals which become dilated into large lymph spaces, although at the same time in other areas there is apposition going on by means of osteoblasts. The spongification in his opinion is the last stage of a growth which does not normally occur in the temporal bone, but is the rule in other bones, and follows here the entire disappearance of the cartilage present in the intercellular spaces and on the border of the oval and round windows and also by the growth of compact bone into the osteoid tissue, and finally into the spongy tissue.

"Habermann, who studied the subject with equal care but with specimens derived from patients who had suffered from middle-ear disease, believes that the affection proceeds along the vessels from the middle-ear into the inner ear. Finally, Denker, as a result of a study of the collected literature as well as personal investigation, in 1904, reached the conclusion that the disease might be in some cases secondary to middle-ear disease, but was usually of a primary nature, and recognized at that time the difficulties which have since presented themselves,

due to the variable location in the labyrinthine capsule of the diseased areas. Since Denker's monograph on the subject, the views of many investigators have been materially altered as the result of a masterly study of the subject by Manasse, of Strassburg, entitled, '*Die Otitis chronica Metaplastica der menschlichen Labyrinthkapsel.*' Manasse, previously in Basle, advanced, but only last year published, this result of his studies in the examination of seventeen temporal bones derived from 10 cases, a study extending over twenty years. As in the case of Siebenmann, the contributions of Manasse are particularly important because of the fact that he is a trained pathologist."

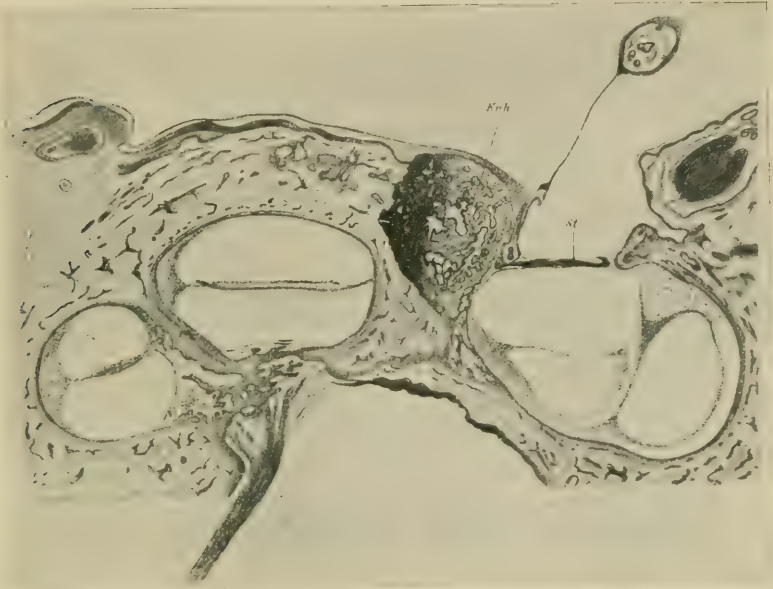


FIG. 10.—Case VII. Horizontal section through the region of the oval window. A small area of new-formed bone on the anterior border of the oval window. The mass is light in color near the window, darker in color near the cochlea. The last are the recent, the first are the older portions. The mass extends somewhat into the window niche, but does not involve the stapes nor the annular ligament. There is no stapes ankylosis. In the cochlea can be seen atrophy of the organ of Corti, and an atrophy of the connective-tissue growth in the spiral ganglion. The atrophy of the acoustic nerve is the result of the tumor which existed in this region. The cochlea, the sacculus, and the utricle are filled with hyalin. (From Manasse's collection, with permission.)

Having reviewed Manasse's work briefly in last year's *PROGRESSIVE MEDICINE*, I shall not dwell upon it, as it is much more fully and adequately discussed by Harris. The accompanying illustrations, reproduced from Manasse by permission of Harris, are sufficiently explanatory, with their captions.

One must agree with Harris, that, however interesting Manasse's

histological studies may be, of far more interest, from the point of view of the clinician, is his statement with reference to ankylosis of the stapes in his cases, and the deductions which he draws. I quote again from Harris: "In only 3 cases, five temporal bones, was ankylosis found. In the remaining twelve bones the joint was uninvolved. Manasse concludes, based on these findings, that, anatomically speaking, stapes ankylosis can no longer be regarded as an essential part of the disease, nor even can it properly be said that these findings are due to the early



FIG. 20.—Case VIII. Advanced disease of the labyrinthine capsule. Almost the entire bony cochlea is transformed by the osteitic process. Only a small spot shows normal labyrinthine bone, N. L. K. We can see with this weak enlargement that the larger part of the new-formed bone is very old, light in color, poor in blood-vessels, and formed out of dense sclerotic bone tissue. Only on the inner periosteum can be seen a few dark-colored recent portions. K. N. H. A small area of new-formed bone. Complete stapes ankylosis, with the foot-plate strongly involved in the new bone formation, particularly on the posterior border. Degenerative atrophy in the membranous labyrinth, both portions of the acoustic nerve very thin. A. N. c. Atrophic cochlear nerve. A. N. b. Atrophic vestibular nerve. (From Manasse's collection, with permission.)

stage of the disease, and that later there would have been such an involvement, for, in 2 cases at least, the microscope shows the process to have been evidently an old one, which had stopped short of the stapes and the annular ligament. Manasse argues, furthermore, that even if stapes ankylosis is met with, it is impossible to say that it is bony in nature and due to the disease in question. He supports this contention by giving the histological findings of 3 cases of ankylosis, the first due to a lime deposit, the second one due to otitis media chronica



adhesiva, and the third, a result of a general periostitis of the stapes and of the inner wall of the middle ear. It is evident that whatever the cause of the ankylosis, the functional tests will be the same, and

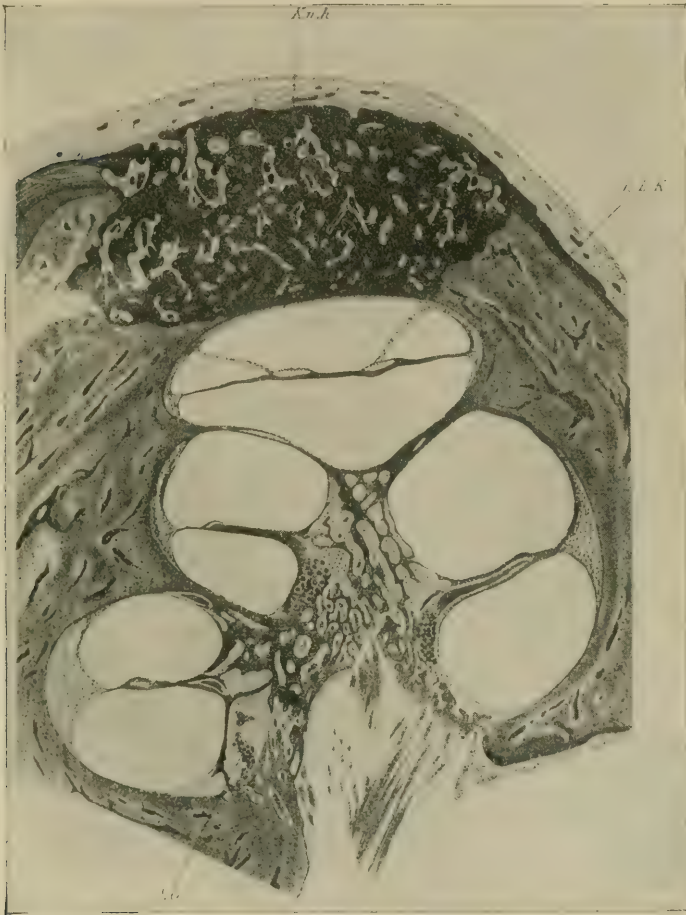


FIG. 21.—Case X, Right. A section through the cochlea; circumscribed pathological area of bone (K. n. h.), in the capsule extending to the cochlea. The transformed bone involves the entire thickness of the capsule from the periosteum of the middle ear to the inner periosteum of the cochlea. It is formed almost exclusively of recent newly formed bone, as can be seen from the dark color. In the membranous labyrinth, degenerative atrophy, in the organ of Corti, the spiral ganglion and in the fine ramifications in the cochlea. The sinking of the Reissner's membrane is not pathological but postmortem. N. L. K. Normal labyrinthine bone. (From Manasse's collection, with permission.)

Manasse accordingly advances the view mentioned previously and shared in by Panse, that chronic progressive deafness is not possible

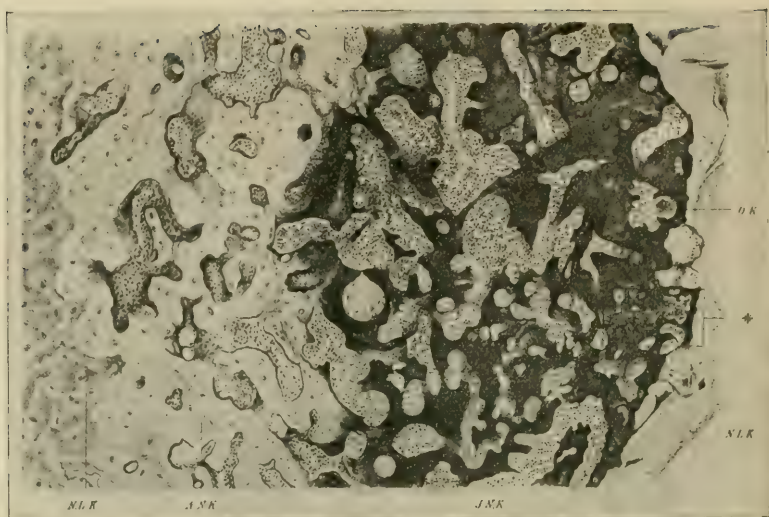


FIG. 22.—Case I. Section through the portion of new-formed bone lying near the cochlea. A stronger enlargement. We see on the left the light colored older portions of the new-formed bone. A. N. K. On the right, the dark-colored younger portions. J. N. K. Both are sharply separated from the normal labyrinthine bone. N. L. K. The former consists of dense bony tissues containing a few large vessels. The latter contains many more open spaces and many more cell elements. At O. K. we see an osteoclast in the new-formed bone. Nowhere are osteoclasts to be seen on the border of the pathological and the normal bone. Here always the newly formed bone substance crowds close on to the old labyrinthine bone without any cell elements. The star shows the cribriform rarefaction of the new bony growth. (From Manasse's collection, with permission.)

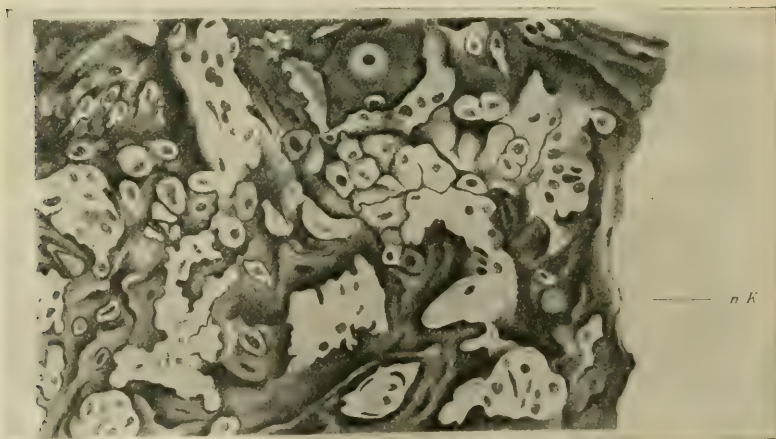


FIG. 23.—A higher magnification of the previous figure showing destruction of the new-formed bone as the result of cribriform rarefaction. The bone is very porous. A cell is to be seen in each cavity. In certain places the cavities have separating walls which are very thin. In other spaces these are lacking and they are confluent, forming streets or large spaces on the border adjacent to the normal bone. M. K. No cells are to be seen. (From Manasse's collection, with permission.)

of diagnosis. We can readily understand how, with all that has been written to throw doubt on the subject, one can gain this pessimistic decision. We cannot, however, admit Manasse's contention. It must not be forgotten that 'Otitis chronica metaplastica der labyrinth-kapsel,' so minutely and painstakingly described by him is strictly an anatomical disease. It is undoubtedly true that it may develop in other parts of the labyrinth capsule than in the oval window, and in



FIG. 24.—Case V, Right. Section through the recent portions of large new bony growths. Extensive destruction of the dark-colored new tissue partly as the result of the Howship'schen, lacunæ, and osteoclasts (O. M.), and partly the result of cribriform rarefaction of the bone substance seen on the right-hand side below. On the left again new-formed bone. (From Manasse's collection, with permission.)

such cases may produce no symptoms unless the membranous labyrinth is involved, when the upper notes will be affected. It is undoubtedly correct to say that there are many such cases which have never been recognized. It is, however, the clinical manifestations of the disease which interest us and concern us alone, and it is only when the disease has advanced to involving the stapes and causes an impairment of fixidity of that bone that we can speak of it in a clinical sense. So it



is proper to say that while there is an anatomical disease, there is also a clinical disease, and this, for lack of a better name, will continue to be known under the name of otosclerosis.

"While it is true that any form of ankylosis will produce the same functional tests, other causes than that due to a bone occlusion are so rare as to be excluded, although it must be borne in mind that such exceptions do occur. Panse states that he recalls a number of cases of deafness developing subsequent to confinement, which, from the clinical course, the functional tests, the otological pictures, and history of heredity, would have been regarded as otosclerosis. They, nevertheless, by the use of the catheter and massage, made a marked and lasting improvement. Such exceptions occur and are constantly to be borne in mind in too promptly pronouncing the case hopeless."

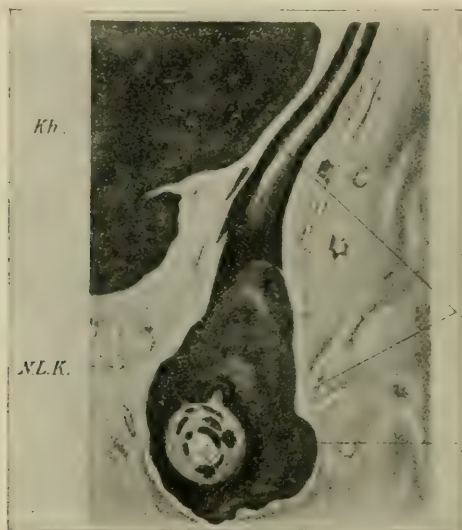


FIG. 25.—Case IV, Right. A higher magnification. Bloodvessel in the bone (Kn. G.) Within the normal labyrinthine bone. (NI. K. M.) The vicinity of the new-formed bone. (K. b.) On the outer wall of the bloodvessel we see new-formed, very young bone tissue, (N. g. K.), which presses, in the form of hummocks, against the old bone and the bloodvessels, which are thus being caused to disappear. (From Manasse's collection, with permission.)

In summing up, Harris expressed the belief that the pessimism in regard to understanding and diagnosing the disease is not warranted, and that while it is true that much is yet to be learned, both as regards the histology and the etiology, and that there is little hope of finding a cure so long as the latter is so obscure, it may confidently be said that, in the majority of cases, a determination of the disease is entirely possible. He reiterated his own previously expressed view that middle-ear suppuration must not be lost sight of in searching for a possible etiological factor (see Figs. 19 to 25).

THE TREATMENT OF OTOSCLEROSIS has called forth some experimental observations. Lake<sup>1</sup> and others have employed *radium*, but none of the reported results have been convincing. There is no means for determining values when we are dealing with such a mysterious agent as radium. It is well that experiments with it be continued, but it is always to be borne in mind that the charlatan is ever ready to seize upon any therapeutic agent which, having this element of mystery, is apt to appeal to the layman. Radium is no exception to the rule.

Therapeutic experiments with *x-rays* were carried on by Ortloff<sup>2</sup> in the treatment of otosclerosis, but, in his experience, the hearing capacity was not favorably influenced through the radiations.

The similarity in the bony changes of otosclerosis and osteomalacia led Beck<sup>3</sup> to employ hypodermic injections of *adrenalin* in eleven cases of otosclerosis. Hearing was not influenced in any of the advanced cases; in three, less advanced, there was improvement in hearing. Tinnitus ceased in one case.

I may reiterate what I have said on various previous occasions, that the treatment of otosclerosis resolves itself largely into a question of prevention. In other words, it is a question of eugenics. We cannot here waive aside as of no moment the operation of the Mendelian theory of heredity. This law is as manifestly operative with regard to this condition in human subjects as it is with reference to any characteristic of development in peas or in rabbits. For this reason eugenists and otologists should discourage the intermarriage of the offspring of parents with unquestionable otosclerosis, lest the defects of the grandparent become manifest in the grandchild.

The treatment of otosclerosis in the individual resolves itself into three categories: (1) Measures for the entertainment of the patient—*x-rays*, radium, mesothorium, and whatnot; (2) internal medicine; (3) general hygienic measures—practically doing nothing. If three series of patients were treated along these three lines for a period of time sufficiently long to warrant noting results, I am convinced that the third class would show just as large a proportion of favorable changes as either of the other two. For this reason it is well to exercise caution in reporting benefit from any given procedure.

In this connection it may be said that favorable results have been reported by Hugel<sup>4</sup> with *radium* and *mesothorium-radiations*, in the treatment of *hardness of hearing* and *aural tinnitus*. The majority of these observations concerned long-standing cases, in which the radium-radiation was tried as a last resort, after several years of treatment. Some of the patients made use at the same time of baths, inhalations,

<sup>1</sup> Ann. of Otolaryngology, Rhinology, and Laryngology, December, 1912, vol. xxi, No. 4, p. 1085.

<sup>2</sup> Arch. f. Ohren., 1913, vol. xc, p. 233.

<sup>3</sup> Ann. of Otolaryngology, Rhinology, and Laryngology, vol. xxii, p. 203.

<sup>4</sup> Münchener med. Wochenschrift, 1913, No. 38, p. 2110.

etc.; otherwise, no additional local treatment was employed. On account of the prohibitive price of radium, the author utilized a small mesothorium pencil, containing 1 mg. of mesothorium, which is easily inserted into the auditory meatus and can be kept clean by an aluminum sheath. Into this sheath, small bits of metal may be introduced, to serve as filters. This modified apparatus seems to be equally useful, according to past experience, in spite of its lesser radiation, for the effect is exerted much more closely to the middle ear. The height of the improvement is apparently reached in most cases after six or eight to twelve radiations. It is advisable to wait for two or three days between radiations, but the treatment may be applied on several successive days without harm resulting. After prolonged pause, of weeks or months, further improvement often follows upon renewed radiation. Aside from slight variations, this improvement persists for a considerable time, up to six months, in the first treated cases. The correct time of radiation seems to be one or two to four minutes.

Concerning the mode of action, the author emphasizes the general stimulating effect of the radium salts upon all kinds of tissues. Perhaps, a hyperemia is brought about in the affected localities, for an increased sensation of heat in the ear is frequently mentioned. Presumably, however, an "elective" action of the radium upon the nervous end-apparatus, and possibly the central organs as well, must also be taken into consideration, for a simple hyperemia would hardly seem to explain the long-continued improvement.

**Tuberculosis of the Middle Ear.** Brieger<sup>1</sup> discussed this subject before the Twenty-second Meeting of the German Otological Society, arriving at the following conclusions, on the basis of personal experience as well as the investigations of other observers:

The middle ear is attacked relatively often by tuberculosis, although the special susceptibility to the disease during the first year of life is more apparent than real. The infection is usually a secondary one, by way of the tube. As a rule, it becomes associated with secondary infections of other kinds, which not infrequently first cause the hitherto latent tuberculosis to manifest itself, sometimes inducing fatal complications. From the functional point of view, the ear is affected more rapidly and more seriously, especially in the form of early onset of nervous disturbances, than in other inflammatory affections of the middle ear. Facial paralysis is relatively common and of early onset, especially in the form with a tendency of tissue-disintegration.

The DIAGNOSIS is established most simply and most promptly through the examination of excised tissue segments, for the bacilli in the pus are often scanty, or they may be demonstrable only through animal inoculation, while the local reaction to tuberculin is not always harmless.

<sup>1</sup> Bericht zur XXII Versammlung der Deutschen Otologischen Gesellschaft, Stuttgart, 1913.



Among the SEQUELÆ, hemorrhages from the eroded wall of the carotid artery and the frequent affections of the labyrinth are the most important. A causative connection between tuberculous meningitis and tuberculosis of the middle ear is not so common as the chronological coincidence of the two conditions. The prognosis is always doubtful. Healing of middle-ear tuberculosis seems to be a relatively frequent clinical observation, and is not entirely excluded in any of its forms, although it is least likely to occur in the proliferating tuberculous processes of adults, which appear under the picture of acute middle-ear inflammation. Grave sequelæ may manifest themselves even in an advanced stage of improvement. The cure may be furthered, or started, by operative measures. Aspiration treatment seems to be advantageous in some of the cases.

While one may agree with Brieger, that the middle ear is attacked relatively often by tuberculosis, the infection being, as a rule, of secondary origin, it is undoubtedly true that *primary tuberculosis* of this region is of absolutely rare occurrence. Long<sup>1</sup> adds a case to the small number of reported instances of this condition. He calls attention to the fact, as stated by Goldstein, that up to 1903 but three cases of primary tuberculous infection of the ear had been reported. To these, Goldstein added four, and the number has been increased by others since that time. The primary nature of some of the reported cases, according to Long, may be questioned, but the possibility of primary invasion of the ear by tubercle bacillus cannot be authoritatively contradicted. His case is of interest because of the extreme youth (eleven months) of the patient. The history of the case follows:

"G. W.; English; aged eleven months; female. According to the parent, the child appeared to have a severe cold at the age of one month. Both nose and eyes discharged for a couple of days, which was followed by a discharge from the left ear. The family physician treated the ear for some time by syringing, but no improvement resulted. February, 1910, she was brought to my clinic at the Post-graduate Hospital by the mother. Examination revealed a profuse fetid, purulent discharge from the left ear. The lining of the external auditory meatus was red and irritated. The tympanic membrane was absent. The probe revealed necrotic bone. The examination of the throat showed enlargement of the pharyngeal tonsil, which seemed to interfere with nasal breathing. This was removed. In all other respects the child appeared perfectly healthy. The treatment applied consisted of ordinary cleansing and Politzerization until April. No improvement resulting, a smear was taken and submitted to Professor Zeit of the Northwestern University for examination. He reported the presence of tubercle bacilli in the discharge. Owing to the child's youth, it was impossible to determine the exact condition of the hearing, but it appeared little impaired.

<sup>1</sup> The Laryngoscope, June, 1913, vol. xxiii, p. 700.

The cervical glands were not enlarged and there was no tenderness or swelling over the mastoid process.

"April 29, 1910. The radical mastoid operation was performed, and only remnants of the malleus and incus remained. A mass of granulation tissue virtually buried the stapes, the granulations extending into the antrum. All were carefully curetted away with the exception of those around the stapes. The post-auricular wound was dressed open. Owing to the rapid growth of immense, flabby granulations, healing was protracted and many curettements were necessary.

"June 2, 1910. The post-auricular wound had healed and the meatus was dry. About the middle of May, the right ear was found to be discharging. Professor Zeit reported a pneumococci infection, but no tubercle bacilli. This ear was soon well.

"October, 1910. The child was suffering from a cold, and both ears were discharging after being dry for four months. No tubercle bacilli were discovered, and the response was negative to both the Moro and von Pirquet tuberculin tests.

"October, 1911. The last report of the case came at this time. Both ears were dry and, according to the mother, the child was in general good health. Up to the time I first saw her, the child had never been given cow's milk or artificial food of any description. She did not appear to suffer pain in her ear, while she was so noticeably good-natured that callers were impelled to remark about the attribute."

In reaching the conclusion that this was primary tuberculosis of the middle ear, Long considered the child's youth at the period of onset of the disease, its continuous general good health, the absence of tuberculous infection elsewhere, as proved by the negative tuberculin tests after radical mastoid operation, and the ultimate satisfactory condition of the ear.

The theory of predisposition and inherited tendency was not regarded, the family history being negative with regard to tuberculosis, and both parents being in perfect health. The ignorance and carelessness of the laity, in his opinion, offered ample opportunities for infection. The surgical nature of the case suggested a bacillus of the bovine type and the attack as a result of dirt infection. The features of the case eliminated all avenues of infection save the Eustachian tube and the external auditory canal, with the probabilities in favor of the former.

**Tinnitus Aurium.** "NORMAL TINNITUS" and its relation to the study of tinnitus aurium resulting from disease was made by Fowler<sup>1</sup> the subject of his Candidate's Thesis, presented to the American Laryngological, Rhinological, and Otological Society in 1912.

The observations given in his second contribution cover a period of nine years. They deal particularly with those forms of tinnitus which are practically incessant. In analyzing 1000 clinical cases of

<sup>1</sup> The Laryngoscope, March, 1913, vol. xxiii, p. 176.

ear diseases, Fowler found tinnitus present in 56.6 per cent.; 67 per cent. in the chronic otitis media cases; 50 per cent. in nerve deafness; 33 per cent. in suppurative otitis; 50 per cent. in impacted cerumen; 50 per cent. in polypi cases; 33 per cent. in furuncle and cellulitis of the canal; in eczema, *nil*. In private cases, fully 80 per cent. have experienced ear noises, this symptom, in many instances, bringing the patient to the otologists.

The discovery of the fundamental facts which form the basis of most of Fowler's deductions was the outcome of his utilization, because of extraneous noises, of places of comparative or absolute quiet in making his experiments.

In order to better understand "some of the vagaries of tinnitus accompanying diseases," Fowler studied the determining factors in the causations and variations of tinnitus in normal ears. He found that in normal ears there is constantly present a faint, high-pitched, singing sound, comparable, in many instances, to the hum of myriads of insects afar off. This is heard by children and adults, but not always by the aged. It is usually heard more plainly by neurasthenics and others of highly nervous disposition, being less apparent to the phlegmatic. This "normal tinnitus" is accentuated in various ways: by closing the meatus or applying resonators thereto; by the application of a tight neckband, causing congestion of the head and neck; by the exhibition of certain drugs, as quinin, the salicylates, alcohol, etc.; by compression of the air in the external auditory meatus, inflating the middle-ear (Valsalva's method), suction (Toynbee's experiments) causing little change.

Increased perception of sound during meatus closure is brought about (1) by shutting out extraneous noises; (2) by increasing the resonance of the external auditory canal; (3) by reflection from obstacles to sound exit. Only those experiments, therefore, which were conducted in absolute quiet can be relied upon. Valsalva's experiment produces the same results as pressure. Numerous experiments were carried on with reference to the production of variations in this normal tinnitus.

Fowler interprets the meaning of no increase in normal tinnitus during meatus closure as signifying that the vibrations detected by the ear are not present in the external or middle ear, at least in sufficient amplitude to be affected by the increased resonance occasioned by the former's closure. In other words, they are due almost wholly to intralabyrinthine (cochlea) irritation. He considers this irritation as coming from the smaller vascular streams; if from the larger vessels these vibrations would certainly vary with the arterial or respiratory pulse, which is not the case except in the presence of considerable congestion, and in certain individuals. If the intralabyrinthine pressure is increased by means of air-pressures through the external auditory meatus, by Valsalva's experiments, by a constricting neckband, or by other means,



and insufficient congestion occurs in the middle ear to offset the effect of this increased pressure, all sound by air or bone-conduction is heard less distinctly; hence, also, normal tinnitus under these conditions is heard with less intensity.

The changed or increased tinnitus sometimes noted from pressure by the neckband is presumably due to engorgement of the vessels in and about the ear, and to the loading thereby of the conducting mechanism.

Extra-labyrinthine netotic sounds should be increased by meatus closure. In Fowler's experience this is true.

Fowler found that, as a rule, tinnitus in abnormal ears is influenced by meatus closure and by the neckband, as would be expected from experiments on normal ears. From his observations on both he is led to believe that much can be learned by subjecting patients to the experiments detailed, bearing in mind the results obtained on normal ears.

**Auditory Function.** Numerous contributions to the study of different phases of audition have appeared during the year.

Bocci,<sup>1</sup> in an article on "the theory of audition most in conformity with the complex morphology of Corti's organs," emphasizes the insufficiency of the available theories of the auditory perception, for they take into consideration only individual portions of the very complex organ of Corti. All the existing assumptions are open to criticism. Only the hair cells enter into consideration as sensory elements; their vibrations can only be simple in character, and the protoplasm of the Corti cells adapts its molecular movements to the same. The individual vibrations are not fused again until they reach the audition-centre. An adjuvant factor is represented by the peculiar mode of termination of the cochlear fibers, which originate from two or more peripheral cells, and lead to a single cerebral reception cell, where the phonetic vibration is transformed into an acoustic picture.

Herzog<sup>2</sup> cautions against premature conclusions on the basis of demonstration of shortened bone-conduction in the presence of normal hearing. This shortening of the bone-conduction is suggestive of an organic change in the interior of the skull, or in the cranial coverings, respectively.

Wells<sup>3</sup> studied auditory function experimentally in order to determine the influence of sounds of different pitch, duration, and intensity in the production of auditory fatigue. Theoretically, he states, the information derived from the study of auditory fatigue offers a fruitful field for the investigation of the auditory function. One of the experiments instituted has a direct bearing upon the much-contested function of the cochlea, and tends to conform the neo-Müllerian theory which

<sup>1</sup> Pflüger's Archiv f. d. ges. Physiol., 1913, vol. cl.

<sup>2</sup> Münchener med. Woch., 1913, No. 1, p. 18.

<sup>3</sup> The Laryngoscope, October, 1913, vol. xxiii, No. 10, p. 989.

applies the law of sense energy to quantity as well as modality. Practically, the information thus obtained may perhaps be utilized to advantage in connection with the crusade for the suppression of unnecessary noises, showing, as it does, the conditions under which sounds produce injurious effects. Furthermore, such experimental studies might prove of practical value in giving a suggestion or establishing a criterion for the possible utilization of acoustic exercises in the improvement and strengthening of failing audition.

The method of procedure for the demonstration of auditory fatigue was as follows: The threshold intensity for a given pitch was first determined for the individual subject. In other words, by carefully testing, the lowest possible intensity necessary to produce a clearly recognizable sound sensation of a given pitch was determined. In testing for this fatigue, the intensity of this original threshold or liminal value was augmented 10, 100, or 1000 fold, the subject's ear being exposed a determined length of time to this multiplied intensity. The hearing would immediately thereafter be tested again, to discover if the original threshold had been lowered or raised, and how much. This process could be repeated any number of times.

In practically every instance a greater or less degree of fatigue was demonstrated. This seemed to vary not only with pitch, duration, and intensity, but with the general condition of the subject at the time of the test, and especially with the state of his attention, or with the disturbing noises even when these were very slight.

According to Wells, his experiments demonstrated conclusively the fact of fatigue in the auditory organ; at the same time they served to impress one with the wonderful powers of recovery of this organ. It was found that it required an average of fifteen seconds to pass from a fatiguing sound to zero and thence ascertain the liminal value. Where the ear showed a high fatigue value, in testing at intervals of fifteen seconds, it gradually fell back, generally becoming normal again in one or two minutes. When one considers how constantly the ear is exposed to sounds not only of extrinsic but also some of intrinsic origin, it must be concluded that it is because of this wonderful recuperative power that the organ does not more frequently show evidences of fatigue, or even of a degenerative change.

The relations of whispered speech and conversational speech are discussed by Veis,<sup>1</sup> who emphasizes the importance of testing the hearing through conversational speech, besides the whispering tests.

Güttich<sup>2</sup> discusses the improvement of hearing, after the performance of the radical operation, through the application of artificial tympanic membranes. Not infrequently, in his experience, an essential improvement of the hearing, for all practical purposes, was accomplished, in

<sup>1</sup> Arch. f. Ohren., 1913, vol. xc, p. 200.

<sup>2</sup> Passow-Schäfer's Beit. z. Anat. des Ohr, 1913, vol xi, p. 244.

patients upon whom the radical operation had been performed, by means of the insertion of small wads of paraffinized cotton.

Concerning the perceptibility of combination-tones, in cases of partial or total defects of the tympanic membrane, Schäfer<sup>1</sup> emphasizes that difference-tones of all kinds and at any pitch are heard in spite of partial or total defects of the tympanic membrane, but the perceptibility of these tones is lessened throughout.

Maljutin<sup>2</sup> advocates the *thermic treatment of ear diseases*. He was enabled to obtain an essential improvement of the hearing in cases of chronic progressive deafness, through the local application of heat to the ears.

This is not new. It may be recalled that Vansant many years ago read an article on this subject, and has continued to use hot air with reports of improvement with reference to both hearing and tinnitus in catarrhal cases. The hot air is applied through the external auditory canal, or through a Eustachian catheter.

Improvement with therapeutic "novelties" is often reported when in reality the change for the better may be attributed to the passage of time. Kept under observation, with no treatment whatever, many of these patients would show improvement.

**Otitis.** The so-called primary osteoperiosteal inflammations, involving the lateral surface of the temporal bone and developing like entirely isolated foci, as a complication of ACUTE OTITIS, represent a subject of controversy among operators and specialists. Frassaint<sup>3</sup> emphasizes the possibility of infection of the periosteum, of otogenic origin, on the basis of the anatomical and topographical relations. Although this isolated periostitis is relatively uncommon, it must be kept in mind that end-mastoiditis is by no means constantly associated with perimastoiditis. A number of clinical observations have been placed on record, showing that the simple evacuation of an extraosseous focus may suffice to cure temporal suppurations following upon otitis. The probable pathogenesis, according to this author, is due to a circumscribed cellulitis, which satisfactorily accounts for the clinical development of the symptoms in most cases, and agrees with the generally accepted theory of the endomastoid origin of the otogenic subperiosteal abscesses of the temporal bone. The diagnosis of this periostitis is difficult, and the localization of the infectious process must usually be based upon the course rather than upon the symptoms alone. For the treatment, a temporary Wilde incision is in order, to be extended if necessary, according to the requirements in a given case.

Upon the basis of their observations in 140 cases, Arslan and Parenti<sup>4</sup>

<sup>1</sup> Passow-Schäfer's *Beit. zur Anatomie des Ohr*, 1913, vol. vi, p. 207.

<sup>2</sup> *Archiv für Ohrenheilkunde*, 1913, vol. xc, p. 245.

<sup>3</sup> "Des ostéopériostitis externes isolées du temporal à point de départ otogène," Thèse de Paris, 1913.

<sup>4</sup> *Archivio Ital. di Otol.*, March, 1913, vol xxiv.



believe that the REMOVAL OF THE AUDITORY OSSICLES will prove sufficient in numerous cases of CHRONIC MIDDLE-EAR SUPPURATION, at least for the control of dangerous symptoms. Sometimes a complete cure may be accomplished in this manner. The operation of tympanomastoid exenteration is performed without necessity in a large number of the cases. A curative attempt with ossiculectomy is not contra-indicated by pains, suppuration, vertigo, fever, or even facial paralysis.

This is a conclusion with which the majority of aural surgeons will not agree. The subject of ossiculectomy for the cure of these cases has been pretty well threshed out. The procedure has few advocates now, on the ground that a case which requires operative interference is more safely and wisely handled by the radical mastoid operation.

Reports concerning the PRESENCE OF INFLUENZA BACILLI IN EAR DISEASES are very scantily represented in the literature, and Hirsch<sup>1</sup> is enabled to supplement these reports by a number of personal observations, confirmed by the cultural findings. The influenza bacillus apparently does not often give rise to genuine otitis, but as a rule merely prepares the solid for the other microörganism, so that the so-called cases of influenza-otitis strictly speaking represent cases of streptococcus, or pneumococcus, etc., otitis, during or after an attack of influenza.

According to Holmgren's statistical investigations,<sup>2</sup> SCARLATINOUS OTITIS varies considerably as to its frequency and severity in the individual epidemics or endemics. The morbidity and mortality of scarlet fever and scarlatinous otitis vary according to the seasons, decreasing in the second half of the year. The frequency of otitis is not a criterion for the malignancy of a given epidemic, although evident ear suppurations are often found in the fatal cases. Many others are found at the autopsy, which have escaped the clinical diagnosis. Secondary infections (diphtheria, etc.) have an unfavorable bearing upon the prognosis.

Among the more unusual observations may be noted the occurrence and significance of transitory glycosuria in the course of ear-suppuration. This is discussed by Zimmermann<sup>3</sup> on the basis of his observation of two corresponding cases. Glycosuria was noted during the climax of acute middle-ear suppuration in the case of a previously and subsequently healthy man, with normal assimilation. This observation was repeated in another case, with transitory non-diabetic glycosuria, during empyema of the maxillary antrum.

One or two personal experiences would lead me to think that more careful observation of these cases might show this is a point of importance, warranting further attention.

Gatscher<sup>4</sup> reports a fatal case of retropharyngeal abscess with

<sup>1</sup> Zeitschrift f. Ohrenheilkunde, 1912, vol. lxvi, p. 193.

<sup>2</sup> Archiv für Ohrenheilkunde, 1912-13, vol. xc, p. 52.

<sup>3</sup> Zeitschrift für Ohrenheilkunde, 1913, vol. lxvii, p. 217.

<sup>4</sup> Monatsschrift f. Ohrenheilkunde, 1913, vol. xlvii, p. 679.

mediastinitis, after the rupture of an acute purulent middle-ear inflammation through the tympanic floor.

Grossmann<sup>1</sup> reports a case of MIDDLE-EAR SUPPURATION WITH AMYLOID DEGENERATION, concerning a woman, aged thirty years, who had died from meningitis and pyemia. Three months previously the patient had suffered from acute middle-ear suppuration and sinus thrombosis. The autopsy showed the presence of amyloid degeneration.

Phillips<sup>2</sup> contributes to the general subject of otitis a discussion of PERSISTENT OTORRHEA IN INFANTS AND YOUNG CHILDREN. The term is applied by him to those cases in which an acute purulent inflammatory process invades the middle-ear space, and continues without abatement for an indeterminate period after the usual five to thirty days, which ordinarily may be considered as its normal course. This type of purulent otitis media should be differentiated from that other rather common class, which may be termed recurrent, in which recovery takes place from each attack only to be followed by recurrence at varying intervals usually as a result of an acute rhinitis. A typical case of the type under discussion is cited. It soon becomes evident, in the persistent otorrhea, that the small tympanic cavity proper could not secrete the amount of pus which flows from the ear, and one is forced to the conclusion that the additus and mastoid antrum at least must be involved. When the discharge has continued beyond about the third week it may be concluded that the case is rapidly becoming chronic and that different treatment is demanded. Of the underlying dyscrasias which almost invariably prevent nature's efforts, aided by local treatment, from effecting a cure of acute purulent otitis media, tuberculosis and syphilis are the most stubborn with which to deal, a large proportion of chronic otorrheas being tuberculous in character. Several types of infection, such as diphtheria, measles, pneumonia, and grip, are obstacles difficult to overcome. All the usual non-surgical measures having failed, the wisdom of surgical interference must be considered. In the author's opinion, the safest and most rational measure is the establishment of post-auricular drainage, and, hence, through-and-through drainage, by means of the simple mastoid operation.

The reasons for this are as follows:

1. It quickly terminates an otherwise persistent otorrhea.
2. It insures against an extension of local bone necrosis.
3. It prevents the case from becoming a chronic purulent otitis media, with all that the name implies regarding a chronic offensive discharge, loss of hearing, bone necrosis, and possible fatal complications.
4. Finally, the most important reason is, the restoration and retention of the hearing-function.

In a considerable number of operations, Phillips reports, he was

<sup>1</sup> Passow-Schäfer's Beiträge zur Anatomie des Ohr, 1913, vol. vi, p. 252.

<sup>2</sup> The Laryngoscope, 1913, vol. xxiii, No. 7, p. 778.

surprised at the frequency with which the pus escapes under pressure through the opening made into the mastoid antrum. Granulation tissue is also present, and in several cases an exposed sinus or dura has been found. These cases operated upon have complained of discharge for from six weeks to five years. In the more chronic ones, the simple mastoid operation has sometimes proved insufficient and the radical mastoid operation has become necessary. In young children, when performed any time between four weeks and three months, the results have been most favorable. Definite statistics of value are promised for another time.

**Intracranial Complications in Affections of the Auditory Apparatus,** Eagleton<sup>1</sup> cites three cases, the histories of which, taken together, demonstrates to his mind many points of differential diagnosis between labyrinthine and retro-labyrinthine lesions. That slight pressure, properly applied to unprotected nerve tracts, may cause temporary suspension of function without any general increase in the intracranial pressure, is well known. This was exemplified in a case of temporosphenoidal glial cyst causing hemianopsia, on which he performed a decompression in two stages.

There is, unfortunately, no method whereby a neuritis of the acoustic nerve may be diagnosed before great reduction in the hearing occurs. Repeated careful functional tests of the cochlear and vestibular apparatus, however, and of the relation of the different functional tests to each other, will enable one to make such a diagnosis with more and more assurance in the future.

He contends that the degree of increased intracranial pressure which, with or without the other unknown factors, so frequently produce intense papilledema with subsequent total blindness is manifestly insufficient to cause a similar loss of function of both auditory nerves, as bilateral deafness in cerebellar tumors is very rare. The acoustic nerve, however, must be subject, in subtentorial growths, to considerable pressure, edema, and possibly to neuritis.

While the deafness associated with intracranial tumors may not be due to a neuritis and edema, still it is conceivable, according to Eagleton, that such edematous pressure, combined with other factors, may cause a suspension of the function of the acoustic nerve at one of its two vulnerable points, enough to produce deafness, the relief of the pressure restoring the hearing.

If these contentions are true, he holds that decompression in the early stage should have as beneficial an influence on the aural disturbances as it has on the papilledema.

The first case reported was one of brain tumor associated with total deafness of both ears and non-excitability of both vestibular apparatus. The decompression operation was performed, with temporary restora-

<sup>1</sup> The Laryngoscope, 1913, vol. xxiii, No. 5, p. 592.



tion of hearing in one ear, the vestibular apparatus remaining non-excitabile. The important point in this case was that, with total deafness of both ears, the removal of pressure by decompression was followed by the restoration of the hearing of one ear to conversational voice at four feet, although the caloric, galvanic, and rotary tests still failed to reveal any excitability of the vestibular apparatus. The intracranial complications in this case were thought to arise from an infiltrating pontine cerebellar angle tumor, with occasional hemorrhage into its substance.

The second case was one of probable tumor of the acoustic nerve sheath. Decompression resulted in temporary disappearance of all retro-labyrinthine vestibular symptoms. The important point in this case was the undoubted influence of the decompression on the nystagmus.

The third case was one of increased intracranial pressure of unknown origin, probably tumor of the cerebellum, presenting: vertigo; sensation of pressure on the top of the head; contracted and interlacing color fields; cerebrospinal fluid under pressure. Associated with these symptoms were progressive deafness ending in total deafness in left ear, and beginning deafness in the right ear. Decompression was followed by entire relief of all general symptoms, with partial restoration of hearing in left ear and complete restoration in right ear.

The study of these three cases led the author to believe that in intracranial lesions of the posterior fossa, there may occur early reduction of the excitability of the vestibular apparatus, not only of the affected but of the unaffected side and perhaps an oscillation of the function of the cochlear apparatus of the unaffected side, all due possibly to an edema of the nerve sheath, which conditions may be revealed by repeated, careful examinations by qualitative tests and can be relieved, at least temporarily, by decompression.

Haymann,<sup>1</sup> in a contribution to the pathology and symptomatology of otogenic abscess of the cerebrum, reports two cases of temporal lobe abscess, advocating timely exploratory puncture, or incision, respectively, even in cases with a somewhat doubtful diagnosis. Without underrating or exaggerating the possible dangers of a superfluous incision of the dura or puncture of the brain, the operator should proceed to interfere in a number of the cases, keeping in mind the fact that the prospects of a cure are the more favorable the earlier the evacuation of the abscess. Non-operated brain abscesses practically always terminate in death, whereas certain patients can probably be saved through timely exploration of the brain.

The difficulties in the diagnosis of otogenic abscess of the temporal lobe, which are frequently underestimated, are well illustrated by the

<sup>1</sup> Münchener med. Woch., 1913, No. 2, p. 65.

author's cases. The macroscopic findings, such as changes of the external surface of the dura, do not permit any definite conclusions in this respect.

In the cases in which it is impossible to find a direct stalk of communication between the point of infection and the abscess, unless one is pressed for time, it is well, in making this exploratory puncture, to bear in mind the advice of Ballance to perform the operation in two stages: First, make an incision, the edges of which are packed down upon the meninges, where they become adherent, thus preventing, as the abscess is drained, the infection of contiguous healthy tissues. When the edges of the wound are thus sealed down and the danger of soiling healthy areas is obviated, one may more safely explore the abscess.

In connection with a personal observation, Calamida<sup>1</sup> discusses the SYMPTOMATOLOGY OF OTITIC CEREBELLAR ABSCESS, emphasizing the necessity of an extremely guarded prognosis in these cases. The patient was a man, aged thirty-one years, who had suffered since childhood from right-sided otorrhea. Sudden onset of pain, vertigo, headache, paralysis of the right facial nerve, together with increased secretion of pus. Three months after the onset of these symptoms, the patient was admitted to the hospital, and a large cerebellar abscess was opened at the operation, which was followed by recovery.

The contribution of Auerbach and Alexander<sup>2</sup> is entitled "A Practically Important Otogenous Brain-complication," and they report an illustrative case of BILATERAL CHOKED DISK WITH AMAUROSIS, after ligature of the jugular vein and evacuation of the left thrombotic sinus. The complication is explained by them through the venous and lymphatic congestion in the cerebrum, which necessarily manifests itself to an especially marked degree when the drainage from the right sinus (which usually enters the left transverse sinus) is obstructed, simultaneously with obstruction of the drainage from the inferior petrosal veins, through the ligature of the jugular vein.

This article by Beck and Crowe<sup>3</sup> is a contribution to the diagnosis of obstructed drainage of the blood from the brain, with special reference to OTOGENIC SINUS THROMBOSIS. According to the authors, the compression of both jugular veins is followed at once by dilatation of the veins of the ocular fundus, as a sign of stasis in the intracranial venous system; under normal conditions this dilatation disappears again with the same rapidity, as soon as the compression is interrupted, even on one side only. This observation may be advantageously utilized for the diagnosis of sinus thrombosis, or thrombosis of the jugular vein, respectively.

<sup>1</sup> Archiv. Ital. di Otol., 1913, vol. xxiv.

<sup>2</sup> Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie, 1913, vol. xxv, p. 431.

<sup>3</sup> Monat. f. Ohren., December, 1912, p. 1549.

**The Labyrinth.** LABYRINTHINE SURGERY. Dench<sup>1</sup> discusses briefly certain methods of procedure as applicable to certain forms of labyrinth disease: (1) A method for entering the labyrinth in cases of suppurative labyrinthitis, with probable extension to the meninges. (2) Methods of dealing with circumscribed areas of labyrinthine caries in which no general symptoms have been present. (3) A method of dealing with diffuse labyrinthitis with no symptoms of extensions to the meninges. (4) Methods of opening the labyrinth in cases of chronic non-suppurative inflammation of the labyrinth, where the operation is performed simply for the relief of vertigo and tinnitus.

In the first class of cases, he considers the Neumann procedure the most available. In the second group, it has been his practice simply to curette the diseased area in the horizontal semicircular canal, so as to remove all diseased bone, but not to open the canal so widely that the barrier which nature has erected for the preservation of the life of the patient is destroyed. The curetted area is blocked off from the general radical cavity as much as possible by a separate strip of iodoform gauze. In the third class, he employs a procedure consisting of: (1) the performance of the ordinary radical operation, with lowering of the facial ridge to its extreme limit; (2) the horizontal semicircular canal is opened at its most prominent portion, and a probe inserted into its lumen. By chiseling downward and slightly backward, so as to avoid the facial nerve, the vestibule may be entered. Drainage of the cochlea is performed as in the previous operation. In the fourth class, it is believed that a procedure attempted upon the cadaver but not as yet upon the living subject may be of value in cases of aural vertigo which resists other methods of treatment. He holds that it is possible to open the vestibule thoroughly below and behind the prominence of the horizontal canal, without performing the radical operation. The procedure is rather difficult and the field of operation contracted, but from the work done upon the cadaver he believes that the vestibule can be opened and thoroughly curetted in this way. Another means of entering the labyrinth which has appealed to him in experimental work is that of entering the vestibule through its superior surface. In this operation the horizontal semicircular canal is exposed as the result of a complete mastoid operation. The zygomatic cells are thoroughly exposed, thus giving a broad exposure of the tympano-antral roof. The dura is next exposed in the middle cranial fossa by the removal of the tympano-antral roof. The bone covering the dura is then removed directly inward until the prominence of the superior semicircular canal appears. If, now, the gouge is applied over the prominence of the horizontal semicircular canal and the superior surface of the petrous pyramid removed, the superior semicircular canal will be opened. Removal of the fragment of bone which comprises the roof

<sup>1</sup> The Laryngoscope, 1913, vol. xxiii, No. 8, p. 814.



of the superior semicircular canal will open the roof of the vestibule. By means of the curette the canals and the terminal filaments of the auditory nerve lying in the superior and horizontal canals, as well as in the vestibule, may be destroyed. Similarly, the posterior canal may be extirpated, leaving the tympanic contents intact, as in the Neumann operation. These studies lead him to prophecy that otologists are about to arrive at a point where labyrinthine exploration will be a procedure of election in certain cases of impairment of hearing, progressive in type, and involving the labyrinth.

The Neumann operation, in my opinion, is indicated in those cases where an acute labyrinthitis has extended to the meninges, and where the object of the operation is to drain the meninges at the internal auditory meatus or as near to it as possible. As a matter of fact, the operation is really not one for labyrinthitis, but for acute meningitis. In all the other forms of labyrinthitis, in which the operation is designed to drain the vestibule and cochlea, a method which leaves the internal plate intact is the more desirable.

The customary *surgical interventions* in cases of *labyrinth-suppuration* are beginning to enter into consideration also for other processes in the internal ear which induce both vestibular and cochlear symptoms, such as vertigo, tinnitus, etc. Botey<sup>1</sup> contributes the observations which illustrate the advantage of operating, but only after having waited in vain, for months and years, for recovery through local and medical measures. If the condition persists in a patient who is obliged to work for his living, vestibulectomy should not be postponed any longer, being in itself an intervention of minor severity. The outcome in one of the author's cases was very favorable, and moderately so in the others. The first case well illustrates the difficulty of distinguishing a labyrinthine vertigo from vertigo of central origin, while the second case shows the possibility of a cure of vertigo and tinnitus, through an appropriate intervention. The third case teaches that although the vertigo is controlled by the opening of the vestibule, the tinnitus is not invariably removed by the opening of the cochlea. The author does not advocate resection of the acoustic nerve, which is a very difficult and dangerous operation, in cases of intolerable ear noises.

Lake, it may be recalled, first advocated and employed practically this procedure, covering the entire subject in a monograph.

On the basis of his clinical and pathologico-anatomical investigations on the subject of labyrinth-suppuration, Brock<sup>2</sup> considers all operative interventions which are restricted to the middle ear as dangerous and contra-indicated, in the presence of secondary involvement of the labyrinth in acute otitis media.

<sup>1</sup> *Annales des Maladies de l'Oreille*, 1913, No. 4; *Archiv. Italiano di Otologia*, 1913, vol. xxiv.

<sup>2</sup> *Zeitschrift für Ohrenheilkunde*, 1912-13, vol. lxvi, p. 267.

This is a view which is largely shared by the German and Austrian schools. Kerrison, in a paper on the operative indications in labyrinthitis, presented before the Clinical Congress of Surgeons of North America, at its meeting in Chicago, in November, practically voiced the same opinion. My own belief is that as experience accumulates this will not be exactly the point of view taken by aural surgeons. There will be encountered cases in which the functional tests indicate a complete loss of function in the labyrinth in which an operation for the relief of the suppuration condition in the middle-ear and mastoid is undoubtedly required, in which the exenteration of the labyrinth will be omitted either temporarily, for further observation, or permanently, owing to the fact that perfect recovery takes place without further operation. This is due to the fact that the labyrinthitis may have been entirely recovered from, with loss of function, without any necrosis of the bone, or without any remaining suppurating area within the labyrinth.

The almost universal advocacy of the operation has been due to the fact that the radical operation has frequently brought on an acute meningitis resulting from the starting up of the process in the labyrinth. For those who insist upon the usual method of doing the radical operation by the use of hammer and chisel, I believe the position expressed by Brock, and held by the majority of aural surgeons at the present time, is the better one. In other words, it is better to exenterate the labyrinth at the time of the radical operation. Those who perform the radical operation by the use of instruments which avoid concussion will be able to stop at the labyrinth in all cases where they do not find a definite fistula leading into the labyrinth, with evidence of necrosis.

I have had sufficient experience to feel warranted in deferring the labyrinth exenteration in cases where there is not some gross lesion which leads one into the labyrinth. Not by any means do all of these cases recover without a second operation, but enough of them do to justify this position. In my experience, none of the cases operated upon, avoiding the concussion resulting from the use of hammer and chisel or gouge, were precipitated into any of the untoward results which have led so many surgeons to follow a dictum which too often induced them to break down the barriers between the meninges and the old suppurative condition.

Lange,<sup>1</sup> in a contribution entitled "LABYRINTH-CHANGES IN TUMORS OF THE CEREBELLUM AND THE CEREBELLO-PONTINE ANGLE," reports four such tumor cases, in which the histological findings seemed to confirm the association of supraganglionic lesions of the cochlear nerve with a degeneration of the spinal ganglion and the peripheral fibers, although it is not excluded that the sense cells and the supporting

<sup>1</sup> Archiv für Ohrenheilkunde, 1913, vol. xc, p. 180.

apparatus may persist for a considerable time notwithstanding the existence of lesions of the nerve itself.

The contribution of Berlstein and Nowicki<sup>1</sup> to the subject of TUMORS OF THE ACOUSTIC NERVE illustrates the importance of testing the labyrinthine function, in neurological no less than in otological practice. In a case observed by the authors, the existence of deafness with absence of the vestibular reaction on the affected side, represented the only local symptoms of a tumor of the cerebellopontine angle, the size of a hen's egg.

Concerning the PROGNOSIS OF DIFFUSE INFLAMMATION OF THE LABYRINTH, in genuine acute otitis media, Ruttin<sup>2</sup> considers the labyrinthitis to become the more dangerous the later it develops in the course of the middle-ear affection, for the reason that the longer delayed is the appearance of the labyrinth involvement the greater the probability of its suppurative character.

This does not bear out my experience. Those cases of a very virulent type, in which there is immediately initiated a labyrinthitis which progresses at once to meningitis are the ones which are fatal. Operation, in such cases, is performed not for the labyrinthitis, but for the acute meningitis in which the infection has passed through the labyrinth. The Neumann operation is here the only one to employ. These cases represent a type in which practically no cures have been recorded.

Kirchner<sup>3</sup> contributes an observation on a GUNSHOT INJURY OF THE EAR, in which the birdshot passed through the tympanic membrane into the middle-ear and remained for nine months in close contact with the internal tympanic wall, giving rise to severe manifestations on the part of the labyrinth.

Experimental investigations concerning INFLAMMATIONS OF THE LABYRINTH were carried on by Blau<sup>4</sup> upon cats, by means of direct bacterial infection of the labyrinth. It was found that bacteria may pass through the subarachnoid space without giving rise to demonstrable inflammatory symptoms. The bacteria could be demonstrated through the culture-method in the fluid obtained by spinal puncture, at the end of two and a quarter days after the infection of the labyrinth.

Labouré<sup>5</sup> observed a patient in whose case the radical operation was followed by repeated attacks of LABYRINTH IRRITATION. There was a bony sequestrum of the labyrinth wall. The disturbances subsided after four injections of autogenous pus (autovaccine), which led to a complete cure, with improvement of the hearing. The injection was begun with five drops of the autovaccine, ten drops five days later, then twenty drops, finally fifteen drops. The reaction after each injection

<sup>1</sup> Monatschrift für Ohrenheilkunde, 1913, vol. xlvii, p. 415.

<sup>2</sup> Ibid., p. 645.

<sup>3</sup> Ibid., p. 7.

<sup>4</sup> Archiv für Ohrenheilkunde, 1912-13, vol. xc, p. 1.

<sup>5</sup> Revue Hebdom. de Laryngologie, 1913, No. 13.



was severe, with a true labyrinthine irritation in one instance. The chronic otorrhea was entirely cured by the vaccine therapy.

In regard to the VESTIBULAR NERVOUS COMMUNICATIONS, Udvarkelyi<sup>1</sup> assumes the existence of close relations between the vestibular nerve on the one hand, and the sympathetic and vagus nerve on the other. This would serve to account for the symptom-complex of *sea-sickness*.

An abridged translation is given by Darling<sup>2</sup> of Junca's contribution.<sup>3</sup> to the study of ELECTRO-DIAGNOSIS IN DISEASES OF THE LABYRINTH. I take the liberty of quoting in full Dr. Darling's abridged translation:

1. *Auditory Reactions*. The cochlear nerve does not react, under normal circumstances, to a galvanic current. If, however, there is a lesion in any part of the ear, a current of from 5 to 6 ma. may produce the sensation of noise—auditory hyperexcitability. Faradic stimulation produces no effect on sensory nerves. An auditory reaction is occasionally produced, but this is probably due to stimulation of the tympanic muscles.

2. *Equilibratory Reactions*. A galvanic current of from 3 to 5 ma. passing through the head from one ear to the other causes an inclination of the head toward the positive pole and a sensation of vertigo. The labyrinth in pathological conditions may become hypoexcitable or hyperexcitable. Hypoexcitability is shown by the fact that the inclination of the head cannot be elicited (absolute resistance), or only by very strong currents (relative resistance). Hyperexcitability takes two distinct forms—firstly, the objective form, where the current required to produce the reaction is markedly diminished, or the amplitude of the inclination markedly increased; and, secondly, the subjective form, where exaggerated vertigo, nausea, and vasomotor phenomena are present.

*Technique*. One should have at one's disposal a faradic current (useful, but not absolutely necessary) and a galvanic current of about 35 volts, the intensity of which is capable of being varied from 0 to 30 ma. One requires also a milliampèremeter, a rheostat, an interrupter, and a reverser. For testing the auditory reactions, Roumaillac's auricular electrode is used, the instrument being swathed in absorbent wool before introduction into the meatus. For the equilibratory tests, one uses small oval electrodes covered with a thick layer of gauze, which is moistened before application. An ordinary electrode, with a large surface, is also necessary. The electrode should be fixed in position on the patient's head with a rubber band. The interrupter should be so arranged that manipulation of it will not impart any motion to the patient's head, nor cause any sound audible to the patient. The equilibratory reactions should always be investigated first, as the vestibular apparatus is easily fatigued.

<sup>1</sup> Zeitschrift für Ohrenheilkunde, 1913, vol. lxvii, p. 136.

<sup>2</sup> Journal of Laryngology, Rhinology, and Otology, 1913, vol. xxviii, No. 1, p. 25.

<sup>3</sup> Rev. Hebdom. de Laryngol., d'Otol., et de Rhinol., March 30, 1912.

1. *Equilibratory Reactions to Monopolar Stimulation.* The patient stands with his feet together. The auricular electrodes are placed a little in front of and above the tragus of each ear. They are fastened in position with a rubber band which also covers the eyes. The positive wire is fixed to one of the auricular electrodes and the negative to a large electrode placed over the epigastrium.

(a) The closure reaction is first tested, the direction and amplitude of the head inclination being noted as well as the strength of current necessary to produce the reaction.

(b) The reaction to current of constant strength is next tried. A constant current of the same strength as was necessary to produce the closure reaction is passed and the result noted.

(c) The reaction to slowly variable current is next investigated. The current is slowly increased in strength until the patient is on the point of falling or is unable to tolerate further increase.

(d) Finally, the opening reaction is noted. On breaking the current, the patient may either return to his original position or the vertigo may be increased.

The tests having been repeated with the current reversed, the other ear is examined in the same way.

2. *Equilibratory Reactions to Bipolar Stimulation.* For these tests the positive and negative wires are attached one to each auricular electrode. The closure reaction alone is noted.

3. *Auditory Reactions.* Roumaillac's electrode is placed in the meatus and an ordinary electrode on the perigastrium. The reaction to the faradic current is first tried, the current being gradually increased in strength. If a current which produces moderate contraction of the facial muscles causes no auditory sensation, one passes on to the galvanic tests. The galvanic closure reactions with positive and negative electrode is tested in each ear. One notes in each case the strength of current necessary to produce the reaction.

CLINICAL VALUE. (a) *Auditory Reactions.* The electrical results coincide with those obtained by acoumetric examination. Absence of electric excitability associated with complete loss of hearing is a certain sign of nerve degeneration and indicates a very grave prognosis.

(b) *Equilibratory Reactions.* Absolute resistance indicates with certainty functional death of the centre of equilibrium. Well-marked relative resistance is a serious symptom. Variations in the side to which the head is inclined seem to have little diagnostic significance.

"Electrodiagnostic methods must always be combined with the ordinary clinical methods of examination."

**Nystagmus.** Hubby<sup>1</sup> presented, as a Candidate's Thesis to the American Laryngological, Rhinological, and Otological Society, in 1912, a consideration of nystagmus produced by galvanism. The purpose

<sup>1</sup> The Laryngoscope, 1913, vol. xxiii, No. 2, p. 126.

of the contribution was "to demonstrate that each semicircular canal (through its crista) can be galvanically stimulated to produce its particular type of nystagmus." From various experiments it was found that three distinct types of vestibular nystagmus were produced: (1) Horizontal nystagmus to the right occurred on catelectrotonus of the right horizontal canal; (2) rotary nystagmus counter clockwise resulted from stimulation of the right superior canal; (3) vertical nystagmus upward on stimulation of the posterior canal.

From these experiments the following conclusions were drawn:

"The nearer the electrodes are placed, the more superficial the penetration of the current. This explains the absence of nystagmus in placing both electrodes over the canals within 2 or 3 mm. of each other.

"Although the current penetrated deeply enough to cause reactions of the facial nerve (the posterior metal ridge having been lowered as far as possible without direct exposure of the nerve) it did not reach the cristæ in sufficient density to produce nystagmus. In placing the electrodes 3 to 4 cm. apart (cathode at each canal, anode anterior to tragus) the depth of the penetration of the current was sufficient to cause stimulation of the cristæ.

"The smaller the electrodes, the denser the current, the greater the resistance, and the greater the production of heat. It might be thought that the nystagmus produced by the application of the small electrodes to the canals, might have produced the nystagmus by the production of heat over the canals, and therefore be simply the caloric reaction. This cannot be true since the resulting galvanic nystagmus did not correspond in type with that produced by caloric means. For the nystagmus produced by catelectrotonus of the external semicircular canal corresponded to the application of cold, not heat, to the aural canal of the same side when the head was bent over the left shoulder 90°. In this position the arch of the external canal is highest and the ampulla is below, being mesad—the current of the endolymph would therefore be toward the ampulla and the utricle, on the application of cold.

"The nystagmus produced by catelectrotonus of the right superior semicircular canal corresponded to the application of heat to the external auricular canal of the same side with the head erect, not bent to the left 90° as in the experiment.

"In like manner the nystagmus produced by catelectrotonus of the right posterior semicircular canal corresponded theoretically to the application of heat to the right posterior semicircular canal with the head erect, or the application of cold to this region with the head rotated downward 180°. In the experiment under anesthesia the head was bent to the left 90°, not held erect or bent downward 180°.

"In the experiment without anesthesia the head was erect and yet



the type of nystagmus was not altered, except in stimulation of the posterior canal.

"The explanation of the different results obtained over the posterior canals, with and without anesthesia, requires further experimentation."

Page<sup>1</sup> calls attention to the fact that, so far as he has been able to ascertain, the case reported in this paper was the first *operation for the relief of aural vertigo* or a non-suppurative labyrinth ever performed in this country. Milligan, Lake, Yearsley, and others, abroad, however, have performed a number of such operations.

In attacking the labyrinth in the case cited, the horizontal and anterior vertical canals were opened and traced forward until their ampulla were reached. These were removed, and the canals were then followed backward, and the vestibule was entered posteriorly through the solid angle. The stapes was removed. Because of the acoustic disturbance, it was thought best to open the cochlea also; the promontory was then cut away. The labyrinth, judged from appearance alone, seemed normal. The Eustachian tube was curetted thoroughly down through its isthmus with Yankauer's instrument. The wound was washed with normal salt solution and packed with plain gauze, a little iodoform gauze being placed next the labyrinth itself. Ten days later a meatus and flap were cut and the incision closed behind. Three weeks later the cavity was skin-grafted. There was no exposure of the facial nerve and no paralysis. Six months after the operation the ear was healed. The patient felt well during all this time, but was still not able to turn his head and eyes suddenly to the right without swaying. At the time of the report he was still experiencing some difficulty in walking in the dark, or with his eyes closed, though this difficulty was becoming less. There was no movement of objects after exertion, or pounding in the ear, as there had been before operation. There was no disturbance of equilibrium due to external sound from his own voice. He still had a slight hissing tinnitus, of which he was conscious before the operation, a point worth noting in regard to operating on the labyrinth for persistent tinnitus.

When the auditory apparatus was stimulated by sounds of a certain number of vibrations, a definite movement of the eyes took place in the plane of a certain semicircular canal in the diseased ear. According to Flouren's law, there was caused by the sound vibrations just as definite a movement of endolymph in the ampulla of that canal as there was by the pump acting directly on the canal in Ewald's experiments. The pulsations from the heart, however, also at times caused the same disturbance; the commotion in the ampulla cannot therefore reasonably be associated with the effect on the auditory apparatus alone. It would seem rather that the effect on the ampulla was coincident,

<sup>1</sup> Annals of Otolaryngology, Rhinology, and Laryngology, June, 1913, vol. xxii, p. 321.

with, but separately caused by, the sound vibrations, which, transmitted through the cochlea, were interpreted as sound.

This conception allows one to maintain the theory of the distinct separation, functionally, of the auditory from the static labyrinth, and to receive the support of the biologist, as well as that of long general acceptance. Page considers that one may still support this theory and realize that the localization of sounds may play a part in orientation just as the localization of objects by means of the eyes does, and as the muscle and tactile senses do. This does not mean, however, that one must accept the view that such a close association exists between the two, static and auditory, that sound, through irritation of the cochlea, influences the endolymph in the ampulla; for it is only when the contents of the ampulla are abnormally sensitive or irritable that the same quality of vibration affects them both.

Spontaneous nystagmus, mostly of the horizontal-rotatory type, with a preserved vestibular function, is regarded by Hirsch<sup>1</sup> as the constant concomitant of facial and cephalic erysipelas. This nystagmus is credited by him with great importance for the differential diagnosis, more especially as an early or prodromal symptom, of value for the timely isolation of erysipelatous or suspicious cases. The symptoms will also help to prevent erroneous conclusions in regard to intracranial complications, in the presence of danger signals, such as meningeal irritation, vomiting, chills, confusion, or delirium, in cases of middle-ear suppuration, before the erysipelas has manifested itself upon the skin. Concerning the cause of this spontaneous nystagmus, in erysipelas, the author suggests toxic processes which may give rise to circumscribed meningeal irritations in the posterior cranial fossa, in the sense of a sympathetic meningitis. This interpretation is supported by the direction of the spontaneous nystagmus mostly or exclusively toward the worst affected side, in conformity with the experience that space-constricting processes in the posterior cranial fossa produce spontaneous nystagmus toward the affected side.

The animal experiments of Leidler<sup>2</sup> concerned the terminal area of the vestibular nerve. Spontaneous vestibular nystagmus was noted to follow in all cases when the arc fibers of the Deiters nucleus in the wider sense have been damaged. When the lesion is located toward the ear, approximately in the centre of the glossopharyngeal focus, there usually appears also a vertical deviation of the eyes and the head toward the side of the lesion. When the injury does not extend beyond the knee of the facial nerve, the nystagmus is likewise directed toward the side of the lesion; whereas in case of lesions earward from the knee of the facial nerve, the nystagmus is directed toward the healthy side. The irritability of the peripheral labyrinth persists after injuries

<sup>1</sup> Deutsche med. Wochenschrift, 1913, No. 7, p. 315.

<sup>2</sup> Monatsschrift für. Ohrenheilkunde, 1913, vol. xlvii, p. 389.

reaching approximately to the knee of the facial nerve, but it disappears in case of lesions extending closer to the ear.

In a contribution to the subject of rotatory nystagmus, Buys<sup>1</sup> speaks of having been enabled to demonstrate, by means of the nystagmograph, an "inverse" nystagmus, analogous to the after-nystagmus of Barany, which sets in during uniform rotation after the disappearance of the rotatory nystagmus, and which is in the opposite direction from the latter.

**The Deaf.** The interest which for the last few years has been manifested by otologists in the welfare of the deaf has shown no abatement during the past year. The National (British) Bureau for Promoting the General Welfare of the Deaf has presented a series of lectures on the cause and prevention of deafness. The third of these lectures was delivered by Dr. J. Kerr Love, of Glasgow, Scotland, at the Royal Sanitary Institute, December 5, 1912. The subject was "Sporadic Congenital Deafness and Syphilitic Deafness." Dr. Love called attention to the fact that deafness is far commoner among the children of the very poor than among those who are more prosperous. A possible exception to this is the true hereditary deafness. Poverty, neglect, and overcrowding, therefore, must play a role of prime importance in the production of deafness, and are the first conditions to be combated in the attempt to prevent deafness. Untreated syphilis, among other causes, operated in conjunction with poverty and its concomitant evils, in the production of deafness. He presented lantern screen illustrations of twenty family trees, from which he showed that of 167 children 30 were still-born. There were 74 deaths, including the 30 that were still-born. Thirty were deaf or deaf and blind. The Wassermann test showed that many of the 63 presumably healthy children of the total number were syphilitic. Meningitis was shown to be the commonest cause of death. In the majority of instances neither the parents nor the children were under treatment. In four of the families examined syphilis was the cause of congenital deafness. Dr. Love, who brought out this fact for the first time, expressed the opinion that this disease is a common cause of congenital deafness. In this connection, he emphatically advocated the notification of congenital syphilis as a step toward the reduction of the death-rate and the deafness-rate among infants. Alcoholism was considered a causative factor in the production of congenital deafness only as it is associated with poverty and overcrowding.

In its editorial department, *The Laryngoscope* avows the purpose of bringing "to the notice of its readers from month to month, facts that may be helpful to physician and patient in dealing with the life-problems involved in deafness." In accordance with this plan, in the issue for August, 1913, Mr. John Dutton Wright, Director of the Wright Oral

<sup>1</sup> Monatsschrift für Ohrenheilkunde, 1913, vol. xlvii, p. 675.



School for the Deaf, New York City, contributed an editorial resumé of an address, delivered in German, by Dr. Otto Glogau, before the German Scientific Society at its meeting in New York, in April. This Society was founded in 1870.

Dr. Glogau emphasized the need of the classification of deaf children according to the degree of deafness, the time of life when it occurred, and the degree of mentality. More careful examination of all pupils by the Bezold continuous tone-system was urged, and the establishment of "hearing classes" in the public schools advised. Pupils who cannot understand whispered speech at a distance of one meter should be placed in these classes. Instruction of the oral method has solved the problem of the education of the deaf. Parents, especially mothers, physicians in general, and otologists in particular, should be alive to possible responsibilities with reference class of children. The importance of the residual hearing of many pupils in institutions for the deaf was especially emphasized.

Mr. Wright, in opening the discussion on Dr. Glogau's paper, said:

"1. The little deaf child should begin its education by the speech method not later than five years of age.

"2. The child that is made deaf by illness or accident should at once be placed under the care of a trained and experienced teacher of the speech-method. The necessity for prompt measures in such cases cannot be urged too strongly; without immediate and skilful attention the child who has learned to speak before becoming deaf will lose that speech. But if prompt and intelligent attention be given, the child's speech can be retained, lip-reading can be learned, and education can go on without interruption.

"3. A very large number of pupils in our public schools are struggling along with defective hearing in the regular classes of forty to fifty with a single teacher. They should have special attention given them in small groups of fifteen or twenty. Examination of the more than half a million pupils in the public schools of New York City revealed the fact that one in each hundred has sufficiently defective hearing to be seriously handicapped in the regular work of the school, yet these pupils are in no sense condidates for an institution for the deaf. They do not belong there and should not be sent there. Most of our public school buildings in this city contain about 2000 pupils. There are among these 2000, twenty pupils whose education should receive more special attention than is possible when one teacher is responsible for forty or more pupils.

"4. There is the very large number of adults who have grown more or less deaf after maturity. These people should be encouraged to form the habit of constantly watching the lips of those addressing them, and taught the supplement their imperfect hearing by the use of their eyes in speech-reading."

In connection with what is commonly called the "German system" of teaching the deaf, but which, according to some, is more properly designated the "oral system," Yearsley makes the following interesting statement: "It is a fact that this method of education was in use in England and Scotland in Dr. Johnson's time, and is mentioned by Boswell in his biography. This was long before it was even thought of in Germany. But one may go still further, and say that a full century before Dr. Johnson visited Braidwood's school in Edinburgh, and was pleased with the way in which a deaf scholar pronounced one of the lexicographer's *sesquipedalia verba* written upon the board, long before the conger of states was welded into the German Empire, an Englishman was educating deaf children to speak. John Wallis, Savilian Professor of Geometry at Oxford, and one of the founders of the Royal Society, exhibited to Charles II, in 1663, a 'deaf and dumb' youth, Daniel Whalley, the son of a friend, whom he had taught to speak and to understand speech. Wallis' method was applied in a few other cases, and its origin may be traced to his tretise 'De Loquela,' on the methods of production of articulate sounds."





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